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HEALTH AND WEALTH

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A SURVEY OF THE ECONOMICS OF WORLD HEALTH

BY

LOUIS I. DUBLIN, PH.D.

STATISTICIAN

METROPOLITAN LIFE INSURANCE COMPANY

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PREFACE

The fifteen essays which make up this volume have been selected from various addresses which I have given during the last three or four years. The response to these when delivered, and later to their reprints, has been such as to encourage the belief that their publication in more permanent book form would be justified. Interest in the public health is fortunately expanding beyond the field of professional workers for whom these papers were, in the first instance, intended. Many lay men and women now realize that the community welfare is best served by increasing health facilities. Possibly these essays will now receive the attention of this larger public. It would be gratifying indeed to me, a technician, if this work could thus be brought to the attention of a considerable number of socially-minded citizens. It has always been my belief that there are enough people willing to read and profit from the publications of our scientific laboratories when these are presented in the simpler terms of the popular address.

While these essays cover a wide range of subjects, they have nevertheless a unifying principle. They cover the more important phases of public-health work and show how vital statistics may be utilized in the public service in the formulation of better health pro-

grams. They trace the recent trend in the principal diseases and conditions and outline the possibilities of prolonging human life. In addition, they consider a number of important demographic problems, such as the vitality of our race stocks, the development of the family, the rate of natural increase, and other aspects of the population question. Through them all runs the thread of the economic value of human life. From my point of vantage in the Metropolitan Life Insurance Company I could scarcely avoid seeing how great are the losses in the community from preventable disease and how great are the stakes in the new public health campaign. These and associated problems in the economics of health have absorbed my attention for many years and it has seemed desirable to crystallize my work in this direction in a form capable of wide circulation. Possibly this is an opportune time to drive home the lesson that life and health are our greatest possessions and that their preservation justifies much greater effort, on economic grounds, if for no other reason. It is my hope that these essays will further stimulate the campaign for better health service that is now developing in the various parts of the country. Never before has there been such interest manifested in our large cities and even in our rural areas. Appropriations for health departments are increasing. But nowhere are these as yet commensurate with the economic value of the life and health of the people. This book shows on every page the inade-

quacy of our present facilities and indicates how larger expenditures may best be used.

I must acknowledge my indebtedness to the editors of the various journals and magazines who have kindly permitted me to reprint these papers. My gratitude is especially due to my efficient and loyal associates in the Statistical Bureau of the Metropolitan, who have helped to produce the material upon which these essays were based. It is a great pleasure to make this acknowledgment and to share with them any merit that this publication may have.

Louis I. Dublin.

December 16, 1927

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HEALTH AND WEALTH

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CHAPTER I

THE ECONOMICS OF WORLD HEALTH[1]

ONE shudders a bit at the very thought of an economic evaluation of life. How much is a mother, a wife, or a child worth? The very words leave one cold; for life in its full implications is not commensurable with money. Life and health have a much higher and deeper value for us than money; in fact, they give value to everything else. Life and health are ends in themselves. They do not require any further justification for their conservation. If, therefore, in this paper I appear to evaluate life and health in terms of dollars and cents, it is not because that is the only way of evaluating them. I am simply attempting to place a money value on one very narrow aspect of life, namely, its actual cost to maintain, and its productive value in terms of dollars and cents. In this sense alone, life and health have economic value, and their evaluation on this basis should render a real service to those who are engaged in their protection.

It is a habit with us Americans to emphasize the importance of our national wealth but always in terms

[1] An address presented to the Institute of Politics, Williamstown, Mass., Aug. 23, 1926, and printed in *Harper's Monthly Magazine*, Nov., 1926.

of real property, of machinery, and of manufactured products. We quite forget that human life exceeds in value all such goods by a very large margin. Human capital is the nation's greatest asset and ordinarily we are very wasteful of our human resources. We appreciate the value of life and health only when we lose them. It is when earnings cease through illness, and expenses mount that we recognize the value of life and health. It is when the breadwinner of a family is removed through accident or disease and the mother and young children must become self-supporting that, first the dependents, and later the community, realize the large capital value which has been lost. But, even if such circumstances bring us the realization of the value of the individual, we give ordinarily little thought to the value of our living assets as a whole. We express in a hundred ways this indifference and lack of understanding. We are free with money as no other people, but are niggardly indeed with expenditures that are intended to conserve life and health. We do not realize how great are the immediate possibilities for saving our human resources and how profitable an investment life conservation can be.

To lay a foundation for the proper understanding of the economics of life and health it is necessary first to determine some items in the cost of human life and to discover also the net value of the earnings of average individuals. For a number of years my associates and I have been engaged in making a series of computa-

tions along these lines. Our first task was to calculate what it costs to bring up a child in a typical American community to age eighteen when he may become self-supporting. Our computations were for the great body of wage-earning families of the country whose total family resources are about $2,500 a year. Under present conditions the cost of rearing a child in such families to the age of self-support, including all the usual items of food, shelter, clothing, education, etc., is $7,238. Including interest on the capital and making due allowance for the cost of those who do not survive age eighteen, the amount is increased to a little more than $10,000. This amount does not include one very important item, namely, the money value of the mother's care. We were compelled to limit ourselves to the family's money income, but we recognize that the working mother makes a real contribution to the total income of the family; for if wages were to be paid commensurate with the mother's value in the bringing up of children, the sum would be considerable and would add materially to the $10,000 actually spent by the family in raising a child to self-support. Our figure is, therefore, a minimum and will serve to keep our other calculations conservative.

The cost of bringing up a child may be looked upon as capital invested which will produce future returns. The process of raising children may be compared with winding up a piece of machinery which is later expected to do useful work. From an economic stand-

point the bringing up of children is an investment, in fact, a very profitable investment not so much for the immediate family as for the community as a whole. The great majority of adults produce a good deal more than they consume and add to the capital value of the communities in which they live. If this were not so, the total national wealth would not increase as rapidly as it has during the last century. Our second effort accordingly was to compute the value of a man as a wage-earner, that is, to determine the returns from the investment in human capital. Our computation proceeded with the same group of people, namely, those who were in the $2,500 income class. We did not include the money equivalent of the wife's services. But, disregarding this item, we found that the present worth at age eighteen of a man's future earnings was calculated well in excess of $41,000, and the present worth of his future expenditures at less than $13,000. The present worth at age eighteen of the net future earnings of a man in this economic class was accordingly close to $29,000. The maximum value of a man in this income class is reached at age twenty-five, when the present worth of his net future earnings is more than $32,000. With advancing age, the present worth of net future earnings declines. At fifty, it is $17,510; at sixty, about $8,500. After age seventy, the present worth of net future earnings is negative because earnings cease and the cost of maintenance continues. An astonishing item in our calculations is the high eco-

nomic value of a child at birth. We found the sum to be $9,333. This is the amount which it would be necessary to put at interest at 3½ per cent, in order to bring up the child to age eighteen and to produce the net income throughout the working-period of life. At age five, the corresponding figure is $14,156 and at age fifteen, $25,341. If we had assumed a higher rate of interest than 3½ per cent, the amounts would have been correspondingly smaller; at 4½ per cent, the value at birth would be one half as high. But in any case, the money value of children is no small matter. They represent, in a sense, the value of the social inheritance which comes to a human being because he is born in an economically organized state.

In the same manner, we computed the value of a man whose maximum earnings are $5,000 a year. This represents a fairly large group of professional and small business men who have had better opportunities to advance themselves than their fellows. At age eighteen, the present worth of the net future earnings of a man in this group was found to be $34,320. The actual maximum value occurs at age thirty-two when the net future earnings are worth $49,100. The $2,500 man reaches his maximum value seven years earlier at the age of twenty-five, but his value as a producer is then $17,000 less. The value of a child at birth in this group is $9,629 and at the other ages of childhood the figures are only a little more than those I have quoted for the children in the $2,500 in-

come families. This is because of the much higher cost of bringing up a child in the higher income class.

It costs money to raise human beings to the point of self-support, at least $10,000, as we have seen. When they begin to work they produce a great deal more than they cost. We have calculated from the data which I have just presented to you—the value of males in the $2,500 income class—what the 60,000,000 male persons in the United States are worth. That is, we have computed, with regard to their present ages, the sum of their net future earnings. The aggregate figure is considerably over a thousand billion dollars. Unfortunately, we are not able to compute with the same exactness the economic value of the female population because the housewife's contribution to the family budget cannot be measured in dollars and cents. But, there are more than 8,500,000 gainfully occupied women in the United States, and those who are not gainfully employed have decided economic value to their families and to the state. If we estimate that the economic value of women in general is only one-half that of men, this will make the value of that sex $500,000,000,000 and the total vital assets, males and females combined, over $1,500,000,000,000. Our national wealth in material assets in 1922 was $321,000,000,000. This includes real property, live stock, machinery, agricultural and mining products, and manufactured goods of all sorts. Our vital capital, therefore, exceeded our ordinary material wealth about five to one.

II

This striking relationship between living capital, on the one hand, and material capital, on the other, is not limited to the United States, although it is possible that the difference between the two may not be as great in some other countries. Professor Nicholson, as far back as 1891, estimated that the living capital of the United Kingdom was five times that of all other capital. It would be a laborious task to determine the corresponding figure for England and Wales at the present time or to check up the figures for other nations. But, I should not be surprised, if somewhat similar figures were obtainable in all civilized countries. For, even if human values, man for man, are economically lower in other lands than in our own because of lower per capita production and lower wages, the same relationship probably holds between live capital on the one hand and other forms of wealth on the other. In any case, we must see very clearly how great is the value of human life the world over. The figures I have quoted suggest how necessary it is to give due consideration to an effort to conserve this, the most valuable of our national resources.

With these figures as a background, we are now in a position to realize somewhat the losses which result annually from the interruptions due to illness and death. Our bodies are, after all, machines which need occasional overhauling. They wear out sooner or later, depending a good deal upon the care they re-

ceive. Sickness is one of the commonest of the facts of life and one of the most disturbing, as it interferes with production and breaks up normal family routine. It will be interesting to estimate the total economic loss sustained in this country on account of illness. Some years ago Dr. Frankel and I made a series of studies on the extent of sickness among a half million insured persons. The figures showed that about 2 per cent were constantly sick. Other observers, following similar methods, have confirmed our results, namely, that the average individual in the United States loses about seven days each year from sickness involving inability to work. There are additional days of discomfort which interfere more or less with a person's duties, but these were not included in the statistics. Converted into economic terms, this means that there is a loss of 2 per cent of total current production. This, in round numbers, amounts to more than $1,250,000,000 annually in the United States. To this figure should be added the cost of such items as medical care, hospital service, drugs and appliances, and the like. To ascertain the extent of these expenditures we made an investigation of the cost of sickness among a group of clerks and found that the average annual expenditure was $19 per capita for medical and nursing care and other items necessary in illness. This figure is probably higher than the average for the general population because the group studied had a rather favorable economic status. But, even if half this figure be used, say in round numbers $10 per capita,

the total cost of medical care, including all items, would amount to more than a billion dollars a year. We may, therefore, say with confidence that sickness costs directly in lost wages, in reduced production, as well as in the necessary care, a total of $2,250,000,000 a year.

Huge as these figures are, they do not cover the total which should be placed to the account of illness. In many instances sickness causes premature death, removing individuals in their prime when they have real and large economic values. Somehow, we must evaluate the total community losses which result from this item of premature death. I have calculated that about a third of the deaths which occur every year, even under the present conditions, are preventable. To be sure, the great bulk of such preventable deaths are in infancy and childhood. But I have shown you that even at these younger ages human beings have considerable monetary value. Every year 120,000 babies die from altogether preventable conditions during the first year of their life. There is no reason for this slaughter except the ignorance of mothers and the indifference of the communities where they live. Possibly it might make a difference if our legislators realized that these babies have a capital value of more than $9,000 if they are boys, and of $4,600 if they are girls, and that the capital lost throughout the country from this preventable infant mortality reaches the astounding figure of more than $750,000,000 a year. If there are those who question my mathematics, I

can still counter by recalling that there are enough preventable deaths of adult men and women which would make a real impression on economic production, to say nothing of the general happiness of the people of the United States. Every year more than 30,000 young men and women between twenty-five and twenty-nine years of age die from entirely preventable causes, and their capital value, having in mind their net future earnings, is about $750,000,000. Having due regard for the value of life at each age period, I estimate that the total capital value of the lives which can be saved annually through the application of modern preventive medicine and public-health measures is over six billions of dollars. The losses, as you see, from sickness and preventable death are enormous, as one might very well expect in view of the immense value of human life in the United States.

III

One would think under such conditions that no effort would be spared to conserve our living resources. But we have scratched only the surface of the possibilities in this direction. It would be quite unfair, however, to give the impression that nothing has been accomplished. The gains in extending human life and preventing sickness have been really considerable during the last half-century. There is already abounding evidence that the work of the public-health authorities to prevent illness and to conserve life, considered from

a purely economic viewpoint, pays large dividends. Let us take the situation in a city like New York. The results are fairly typical of what has happened in other large centers of population. In 1875, the death rate was 28.3 per 1,000; in 1925, it was 11.5, or a reduction of 59.4 per cent. A better measure of the improvement is perhaps the gain in average duration of life. In 1880, the average life-span was about 40 years in New York City and most likely in other urban centers in the United States. It is now 55 or 56 years, a gain of about 15 years in less than a half-century. The greatest gains have been achieved recently. In 1901 a baby born in the United States Registration Area might expect to live 49.24 years; this expectation of life has now risen to 57.74 years. The present figures are not accidental but the result of a definite trend which has been fairly continuous for a whole generation, reflecting the work of a new force in the life of the people.

It will be interesting to examine the facts of the death rate for a number of the more important causes. The diseases which have been most reduced are those which affect infants and young children. In the last twenty years, the infant mortality rate has been cut 60 per cent. In the past, one might almost have said that babies were born to die, for as many as one quarter of them did not survive the first year. To-day, in most American communities, only about 7 per cent die during that first difficult year and two-thirds of these deaths will be prevented in the near future. Not long

ago typhoid fever was a common cause of sickness and death throughout the United States. Even as late as 1900 the death rate was 36 per 100,000 in the Registration Area. Epidemics raged in the large cities of the country because of polluted water supplies and because little was done to prevent the spread of the disease through secondary infection. But, with the installation of excellent water systems in the larger cities of the country, the typhoid-fever death rate dropped in an amazing manner. This disease is now not far from extinction, certainly in the northern and urban sections of the country. The public-health campaign has been especially successful in the reduction of tuberculosis. In 1900, the death rate from this disease was 195 per 100,000. It is now less than one-half as high. More than 100,000 people are kept alive each year who under the old conditions would have succumbed to this disease alone. Diphtheria is another disease which the public-health movement is on the point of wiping out completely. At the end of the last century this was one of the most important causes of death among children. When the first registration figures became available in 1900, this disease had a death rate of 43.3 per 100,000; in 1926, this was reduced to 7.5, and it is rapidly dropping everywhere throughout the country. To-day we are considering seriously the possibility of the complete elimination of diphtheria by 1930 in such large areas as the state of New York. The more widespread application of known methods of prevention such as the general in-

oculation of children with toxin-antitoxin should completely conquer this scourge of childhood.

Possibly the most striking demonstration of the effectiveness of the modern health campaign is the experience of the Metropolitan Life Insurance Company with its millions of Industrial policy holders. Seventeen years ago, this organization instituted a program of health education and of nursing service for its working-class members. This business organization has expended altogether over twenty millions of dollars in this campaign. It has increased its annual budget for welfare work in response to an ever-increasing demand for service and also to the increasingly favorable results of the work done. For during this period the mortality rate has declined more than 30 per cent and the accumulated saving in mortality between 1911 and 1925, which can be ascribed only to the welfare work of the company, has totaled the amazing sum of 43 millions of dollars, or twice the total expended. During this period of the demonstration the death rate from tuberculosis among the Industrial policy holders has been reduced over 56 per cent; from typhoid fever, the reduction has been about 80 per cent; from the communicable diseases of childhood, the reduction was 55.5 per cent, and from diphtheria alone, the reduction was over 62 per cent since 1911. In every important condition the death rate has declined among the Industrial policy holders fully twice as fast as it has in the general population. As a result, the expectation of life of this group of workers and their families

has increased by nine years during the interval, whereas the corresponding increase in the general population is about five years. Health work, when properly undertaken and adequately financed, pays by every test of a modern business organization.

IV

These achievements in the field of public health, both official and private, have completely changed the life of the average citizen in the modern State. People in our country, at least, no longer live in dread of the plague, of cholera, of yellow fever, of virulent smallpox, or of pernicious malaria, and a host of other specters. If they pass the rigors of childhood, they are generally able to round out a good expectation of years, to bring up their families, and otherwise to live a normal and happy life. Never, probably, in the history of the world has there been such widespread well-being for great masses of people. This is, I believe, in large measure, the response to the great improvement in health conditions which has occurred. Increased efficiency and huge productivity, uninterrupted by illness or preventable death, have ushered in many advantages which follow from a high level of economic well-being.

In spite of these achievements, there is still a large field to cultivate. Tuberculosis still causes a hundred thousand deaths annually and a loss of about two and a half years in the average expectation of life of the

entire community. If this disease could be eliminated just that number of years would be added to the expectation of every member of society. Accidental deaths are becoming more frequent with the extension of the use of the automobile and the development of industry. The elimination of accidents would add more than a year to the average expectation of life. A goodly proportion of the deaths from heart disease, certainly those which occur at the younger ages, are preventable, and their prevention would add appreciably to the life span. And, thus in its entirety, if we were but willing to utilize the knowledge which we have of preventive medicine, in the life of the American people, we should raise the expectation of life from its present point of 57 or 58 years to close to 65. The discovery of a method to control cancer and a few other obscure diseases would further increase this expectation appreciably. But, even if we discount these future discoveries and limit ourselves to the application of such knowledge as we now have and which is only waiting to be applied, an average duration of life of 65 years is an entirely possible one for the American people. The people of New Zealand are very close to such an achievement at the present time. What they can do, we with our superior resources can do likewise.

We are confronted, therefore, with a very real situation. We know how great is the value of human life. We know also how great are the current losses from sickness and death. We have the knowledge and the

necessary resources for the control of disease. Obviously, we must put our knowledge to work. That is the program of the public-health movement of the immediate future. To-day, public-health work is in its infancy in spite of its achievements and the demonstration of its power. Most American communities still have political health administrations, inadequately financed, inadequately manned. Less than fifty cents per capita probably represents the total expenditure of the American people for public health. The money spent for medical service is almost altogether for the care of disease and not for its prevention. The relationship were better reversed. A new era of intensive public-health work must be brought about which will make available to the American people the power of this new branch of science. Expert opinion of public-health officials indicates that an expenditure of $2.50 per capita wisely directed through organized channels against the preventable diseases and for public-health education would reduce the annual death rate two points per thousand and correspondingly increase the expectation from five to seven years. The money value of these added years of life as we have seen, runs into billions of dollars. There is no greater opportunity for a quick and more certain return on any investment than an investment in public health. The people of the United States and, in fact, of the whole world have not waked up to the enormous possibilities of profit in preserving life and health.

V

I am not unmindful of the fact that my subject is the economics of world health and that I have given very little consideration to other countries than the United States. This I have done because, as an American, I am most interested in the United States, and also because our country presents a rich detail of data not always present for other countries of the world. We can fortunately establish a basis for the development of an international viewpoint on health matters through the consideration of American conditions. There is, of course, a world-aspect to our problem, and I shall say a word with regard to that.

Much the same conditions exist to-day the world over, although countries vary somewhat with regard to the prevalence of disease, the expectation of life, and the economic value of their citizens. But, everywhere there is a great opportunity for the extension of health and for the prolongation of life and the increase of capital assets. It was in England that the modern public-health program took form and developed; and it is not surprising to find that among the English-speaking peoples the very best conditions of longevity and productivity occur. It is in far-away New Zealand that the longest average life time is found. The expectation of life at birth is more than 62 years in that country, and only somewhat less in Australia. The Scandinavian countries, Denmark, Norway, and Sweden, which very early applied the newer public-

health procedures, have conditions very much like those of the United States, perhaps even a shade better, namely, an average expectation at birth of about 58 years. England itself falls only slightly below these figures, with an average of about 57 years; France, Germany, Italy and Japan before the War had expectations varying from 45 to 48 years, or about ten years less than our own country. India stands at the very bottom of the list of the countries of the world, with an expectation of about 23 years.

These figures are the best basis of comparison we have for the well-being and prosperity of the nations of the world. Where life is long, debilitating sickness is less prevalent and economic production is highest. The extraordinary prosperity which has been witnessed in the United States is, in large measure, the result of the control which has been exercised over disease; of the freedom which men and women have attained to labor without interruption and without fear; the opportunity that our children have gained to grow up in the care of father and mother, amply supplied with the necessities of life and preserved from the trials and sorrows of broken families. Where, as in India, the duration of life is short, existence is surrounded by fear of death, and of crippling, and of invalidism. The capital spent in bringing up children is largely wasted because so few reach maturity to continue their full productivity for a period long enough to pay for themselves, to say nothing of adding to the wealth of their country.

No greater service can be rendered to insure the general peace and prosperity than to improve the world's health. In this field of labor there are no international jealousies, but rather international obligations and opportunities. A low standard of health in any country is a menace to all its neighbors; in fact, to the whole world. It was because Europe and America were indifferent to the existence of influenza centers in Asia that this disease could later spread to all the world, causing more damage to life than the Great War. Prevention of disease and the prolongation of life for the people of India, for example, will bring prosperity to all the nations that have dealings with them; for the people of India will become better producers and, therefore, better customers for the products of the whole world. It is obviously, therefore, to the interest of the leading nations—those who have enjoyed greater advantages and opportunities in health work—to make available these advantages to those who are backward and to those who lack financial ability to institute progressive measures on their own account. The International Health Board, the Health Organization of the League of Nations, and those other bodies which function in international health service are at the very forefront in bringing nations together on a higher plane. Such work creates a better understanding between nations and increases mutual trust and respect. What concerns the health of the people touches after all the most responsive chord in the heart of mankind.

CHAPTER II

THE COST OF MEDICAL SERVICE[1]

HOW to meet the cost of sickness is a major problem with most people. It is a fortunate family, especially if there are young children, that can pass a year without a case of serious illness. The cost of medical care is always an important item in the budget; but when an illness of long duration or one involving hospital care or requiring an operation occurs, the cost is usually staggering. Such an event, especially when it curtails the income of employed persons, at once forces many families into the unfortunate position of having to accept medical charity. Large numbers of middle-class families pay their bills, but chafe under what they generally consider the unjustifiably heavy cost of medical service. Only the very rich can afford a serious sickness without concern over their medical bills. Everywhere, within and without the medical profession, there is the feeling that something is seriously wrong with the economics of medical service. Neither doctors nor patients are satisfied with the present situation. I propose here to discuss some recent developments in the direction

[1] An address presented to the New York Academy of Medicine, Oct. 6, 1927, and printed in *Harper's Monthly Magazine*, Nov., 1927.

of more efficient and economical medical service, although I should explain at the outset that we are far from having arrived at a solution of this vexing problem.

The best estimate of the aggregate cost of sickness in the United States is over two billion dollars a year; the same total as for public education. This is 3½ per cent of the country's income. The huge figure is occasioned by the need for an army of professional workers and lay assistants to care for the large number of sick. For 2 per cent of the population are at all times so ill as to require medical service of one kind or another. They employ approximately 150,000 physicians, whose average net income is a little more than $3,000 a year. About 50,000 dentists have a similar average net income. In addition, 140,000 nurses doing private bedside work average $1,500 a year; about 150,000 practical nurses and 100,000 more employees of various kinds such as orderlies, stenographers, and assistants in hospitals and in the offices of private physicians have an average annual income of about $1,000 a year. The total annual income of all concerned with the care of the sick is over a billion dollars. The cost of hospital service covering 860,000 beds adds 500 millions, and the cost of medicines and drugs is not less than 500 millions more. These figures are of necessity rough, but they total well over two billions of dollars a year.

A number of independent surveys of the cost of sickness in individual families help to confirm this total.

A few years ago, the Bureau of Labor Statistics of the United States Government made a study among twelve thousand wage-earners' families and found that the average medical expense was a little over $60 per family per year. The amount actually spent among these families varied a good deal with the size and income level of the family. Those whose income was between $1,500 and $1,800 a year had an average expenditure of $67.85; between $1,800 and $2,100, $73.75; and those between $2,100 and $2,500, an average of $81.77. Another study conducted by a life insurance company among its large clerical personnel discloses a figure of $80 a year per family for medical and health purposes. This figure is exactly the same as that allowed by an important social agency in its outline of a budget for workingmen's families. We believe it, therefore, to be truly representative of conditions the country over at the present time if we include all economic and social classes. Of this amount from 40 to 50 per cent is spent in payment for physicians' services; 6 to 7 per cent for hospitals; 15 to 20 per cent for dentists; 3 to 5 per cent for nurses and from 12 to 16 per cent for medicines and incidentals.

If the average family spends $80 a year for sickness, the 27 million families of the country together spend a total of over two billion dollars.

A cost of $80 per year would seem not too great a burden for the average wage-earner's family to bear, and there would be no difficulty were this amount fixed for and foreseen by each family. But, unfor-

tunately, the amount of sickness varies considerably among different families and in the same family from year to year. One may go along for a year or two with very moderate expenditures and develop a false sense of security. The year following a serious illness costing hundreds and even thousands of dollars may occur, and the chances are that there will not be sufficient funds to meet the expense. It has been found that in any community one out of every four families will have at least one serious illness in the course of a year. A major operation or a large dental repair job is almost certain to embarrass seriously the typical wage-earner's family. It is this phase of the cost of sickness which is so disconcerting. An average of $80 is a combination of smaller and larger expenditures; the amounts vary all the way from next to nothing to thousands of dollars a year. Just so long as the amount does not exceed the average, it is easily met. When it exceeds this amount, troubles begin. The family, to avoid embarrassment, will in many cases not call in the physician, although he is needed; or having called one, will find itself unable to meet his charges and be compelled to accept charity, or go into debt in order to pay the bill. Many families in these circumstances will resort to patent medicines or to quackery. The high cost of medical care partly explains the popularity of the numerous medical fads and cults now flourishing.

The problem is most acute among the large group of families whose income is over $5,000 a year and

under $20,000. This class suffers most from the present organization of medical service and its high cost. The small average figure of $80 per year does not apply here. Unfortunately, we have no accurate data of their expenditures. But there is every indication that their average is at least several times that of wage-earners. These families do not avail themselves of free or inexpensive medical service as do their poorer relations. They are usually charged in accordance with their economic resources. A major surgical operation will rarely cost less than $1,000 when all items are included. Some leading surgeons charge a fee of 10 per cent of the year's earnings. The birth of a baby in such a family usually costs the best part of $1,000 when all medical, hospital, and nursing fees are included. Hospital costs are especially high for this group. The use of a private room and special nursing care, together with the other incidentals of hospital treatment, make a total which is often prohibitive.

We are not concerned, in this discussion, with the cost of medical service for the rich.

II

The physicians of the country are not unaware of the existence of this problem. They meet it every day in their work. Many of them have attempted to solve it, as it affects them individually, by scaling down their fees, on occasions, to what they think their

patients can afford to pay. But this expedient has its limitations. While many physicians and surgeons show their readiness to take care of the poor by reducing fees markedly, others will not take patients unless a minimum fee is paid, and this may well be beyond the ability of the patient. Physicians generally agree that this method of reducing fees is not particularly satisfactory. Unscrupulous persons will sometimes give their doctors a false impression of their financial condition. Patients often require the use of expensive laboratory facilities, as well as x-ray examinations, bacteriological and other tests before an accurate diagnosis can be made. Such services are in their nature expensive and it would be difficult to cut their cost because they are rendered by laboratories and institutions which are independent of both patient and doctor. It is altogether clear that a method of payment which involves a flexible fee varying with the economic condition of the patient is unscientific and offers no real solution to either physician or patient. No other service is paid for on this basis and physicians will always have great difficulty in justifying this procedure however generous it may appear to be. A better way must be found.

It is easy to develop a critical attitude toward the medical profession in considering this subject. It is true that many prominent physicians make a great deal of money, and that specialists charge large fees for their services—out of all proportion to those of the general practitioner. There is also, unfortunately,

much evidence of poor work and of fee splitting on the part of some physicians. Although all this is true of other professions equally, many people believe that the medical profession as a whole is unreasonable and even mercenary in its relation to the public. Nothing could be farther from the truth. There is no more high-minded and devoted profession in the world than the medical profession. As we have already seen, the average annual earnings of the physician are very moderate indeed, considering his training, the many years of his preparation, the expensive equipment which modern medicine calls for, the responsibility, the hardships and rigors of the profession, and the need for long vacations and study periods to keep abreast of the times. Many doctors, moreover, devote considerable time and effort to work done without any compensation, such as service rendered to the poor in hospitals and clinics. One estimate places the amount of time given to such work as one-sixth of the doctor's working time. Research work and community activities of various kinds are making larger inroads on the physician's time and correspondingly reduce his income. All of these items justify earnings well above what the rank and file of physicians actually receive. Three thousand or thirty-five hundred dollars a year is small compensation and is incommensurate with the value of the physician's skill to the community or with the compensation of men in other professions or in business. If there is legitimate complaint against the cost of medical service, it should not be directed against

the doctors. They, as well as patients, are victims of a system which is not well adapted to the need of the times.

III

It is the present high cost of hospital service that more than anything else makes serious illness a heavy burden. The increased elaborateness and effectiveness of medical equipment, the centralization of medical and surgical skill and the presence of other trained personnel, the elimination of home worries and the avoidance of cross infections make it highly desirable that cases be treated there rather than at home. The average city-dweller is not likely to receive the necessary care in his small and congested apartment. Sickness surveys made by the Metropolitan Life Insurance Company some years ago showed that 12 per cent of the cases of incapacitating illness are regularly hospitalized. In large cities the percentage is probably higher. But as the need for hospital care has increased, its cost has likewise risen. Typical hospital cases now entail an expense that seems incredible. Excluding the fees of attending physicians and surgeons, actual records selected at random show that a private case of myocardial insufficiency requiring a hospital stay of fifty-five days cost $1,166, approximately half of the expense being for private nursing care and most of the remainder for room and board. A case of appendicitis cost $450; of mastoiditis, over $750; of

sinus infection, $360; of carcinoma almost $1,500, and of neurasthenia, $800. The inclusion of the doctor's charges in these cases would raise the totals materially.

Hospital managers should be very much exercised over this situation. They realize only too well the economic hardships that are involved for the large number of patients who desire to pay for their service. The very poor, as we have said, may receive care for almost nothing. Members of a typical workingman's family, accommodated in wards, will usually pay fees much below the actual cost of the service. But those above that economic level are expected to pay fixed charges. These, on their face, are above the true cost in order that the hospital may make up the deficit resulting from the free and partly free service. In New York City, the hospitals reporting to the United Hospital Fund gave almost half of their total hospital days to patients who paid only a part of the cost of their care. It is robbing Peter to pay Paul that makes the problem so distressing for Peter.

Yet it would be very unfair to give the impression that this hospital situation is not changing rapidly for the better. Only thirty years ago the income of representative New York hospitals covered only about one-third of their total expense. It now covers two-thirds, and most of this gain has been derived from ward patients. While a large amount of free work is still done, there is more and more insistence on the part of hospital managers that those who can afford to pay in full or in part for their care, do so. Between

1917 and 1923, the eighteen general hospitals reporting to the United Hospital Fund increased their receipts for ward service from $1.46 to $2.67 per day. The average ward rates now charged in the majority of cases are between $3 and $4. There is a small added charge for x-ray work, and for pathological and chemical examinations. Accurate cost accounting which hospital managements have installed indicates that hospital service satisfactory to most cases can be secured for something like five dollars a day, including all items except physicians' fees. Possibly in smaller communities, the cost may be brought considerably lower. Better hospital management, continued reduction in the amount of free service, and the more general use of small wards and semi-private facilities should make possible the scaling down of hospital costs to reasonable proportions. But it is only fair to note that the increased income from these sources has not as yet resulted in reducing the charges for private patients.

The seriousness of the problem of medical economics has resulted from the present organization of medical service. The care of the individual patient in the office of the private physician is bound to be expensive. The time which the average doctor devotes to his private practice must be well paid for if he is to earn a decent living. For one thing, the overhead of the physician's office is a large item and may reach about a third of his total income. The cost of equipment is ever increasing. Nor is the physician's time

entirely occupied during office hours. Patients are not always at hand and unprofitable time may be spent waiting for them. All this necessarily raises the cost of service. To meet this situation and to provide care for people of moderate means, the last twenty or thirty years have seen a large development of what may best be termed "group or team medicine." This consists of medical service in clinics, in out-patient departments of hospitals, in general and special hospitals, in industrial plants, in health centers, in universities and in other social and philanthropic agencies. The clinics are characterized by the presence of a staff of physicians representing the several medical specialties. There are usually available the most recent equipment and appliances which the average general practitioner cannot afford to have. Lay assistants are usually at hand to save the doctor's time and make his work more telling. Patients, moreover, come by appointment and the doctor is kept continuously busy during his working hours. Such economies of operation enable the patient of modest means to consult skilled specialists, if they be needed. Accurate diagnosis is much more likely under such care, and the duration of treatment can be materially reduced. The business-like organization of such service makes accurate cost accounting possible and shows what medical service costs per patient. It would be most desirable to determine the cost of similar services under the conditions of private practice. But although such data are not now available, there can be little if any

doubt that the actual cost is very much higher than in group practice. Group medicine has already grown to enormous proportions and points the way to the partial solution of our problem.

IV

Clinics and out-patient departments of hospitals represent the most striking development of group medicine to-day. In 1900, there were only 150 clinics in the United States. In 1925, there were over 5,000. At the present time about ten million people throughout the country are receiving clinic care. This growth has taken place especially in the large medical centers where hospital facilities are ample. The smaller towns and the rural areas have as yet scarcely any such service. Though clinic patients are up and about, they suffer from every variety of complaint; from minor surgical conditions to the early stages of the more serious disorders such as tuberculosis, typhoid fever, and even pneumonia. Venereal disease and mental and nervous disturbances are frequently encountered. The majority of the patients are women and children, although men are also represented in large numbers. It has been estimated that as high as 15 per cent of all ambulatory cases in many large communities are treated at such clinics. In New York City about a million patients make six million clinic visits annually.

The most significant fact is that these clinics are now giving fair medical service and are becoming self-

supporting at the same time. The early institutions were originally established for the destitute poor and did little more than dispense set prescriptions instead of giving medical service in the modern acceptance of the term. That is how their name "dispensaries" arose. But to-day, conditions are very different. The last two decades have seen a complete change in their character and purpose. Excellent physicians are attracted to them and serve on their consulting staffs. Patients are being examined and treated with much more care. They are, moreover, expected to pay whatever they can for the service they receive. In New York City, for example, the clinics associated with the United Hospital Fund reported that fees collected from patients covered 61 per cent of the total cost of their operation. In these organizations, the average amount received per visit from patients was fifty-five cents, the actual cost to the institution being about ninety cents. At the present time, few of these organizations pay any compensation to staff physicians. If medical salaries were included, as they undoubtedly will be in the future, the price of clinic service will be raised; but the fee will still remain moderate enough for the majority of the poor to pay it without undue hardship.

A number of clinics, where the patients are expected to pay the full cost of the service, including the salaries of the attending physicians, have already been organized to provide better and more economical medical care for middle-class families. They are intended

for patients more prosperous than those entitled to out-patient hospital care, but who have incomes insufficient for consultation with private specialists. They attract especially patients whose ailments require elaborate diagnostic facilities, long-drawn-out and expensive treatment, and the more costly appliances necessary for specialized medical work such as gastro-intestinal and renal diseases require. Only a comparatively small number of their patients complain of acute illness; most of them suffer from chronic complaints or diseases which have not hitherto yielded to successful treatment. The fees charged in such clinics usually cover the full cost of the service including, as we have said, the salaries paid to the attending physicians and surgeons, although some of them do not include full overhead expenses in their accounting. On the other hand, there are a number of clinics organized on similar lines which are a considerable source of profit to their managers, of which probably the most famous is the Mayo Clinic at Rochester, Minnesota.

The pay clinic of the Cornell University Medical College in New York is a particularly interesting experiment in medical practice and demonstrates admirably the possibility of providing adequate care for people of moderate means. It offers its service only to patients able to pay the prescribed fee; others are referred elsewhere for treatment. In determining which patients lie within its scope, it takes into account the size of the family as well as the income and the

type of disease from which the patient suffers. For it is conceded that conditions likely to require long-continued treatment, or the use of elaborate equipment and costly laboratory facilities should be included, even if the family income would ordinarily be large enough to pay for private care. For the most part, patients belong to families having an income of about $2,400 a year. The clinic was opened on November 1, 1921, and on that day, over 1,000 persons applied for treatment. Many were in line for hours, awaiting their turn. During its first six years, about 115,000 patients were registered. Together with the old patients on the books, about 21,000 people are treated each year and about 475 patients now come to the clinic each day. Over 130,000 visits were paid last year and the attendance is steadily growing.

This pay clinic at Cornell University replaces a charity clinic which was formerly considered a necessary part of the teaching equipment. The free clinic was operated at a considerable deficit. At the end of the second year after installing the new plan, the deficit of the clinic was reduced a half, and during the last few years it has been entirely wiped out. The clinic is now said to be self-sustaining. Patients are charged a flat fee of $1.50 per visit, but pay supplementary fees (at cost) for x-ray plates, for laboratory tests, appliances, eye-glasses, medicines, and other special items. In the year ending June 30, 1927, operating costs including depreciation on equipment

amounted to $314,000, or an average of about $2.39 per clinic visit. As we have said, the charges for this service covered the cost, but the average amount paid by the patients, including the extras, varied considerably according to the type of service required. In some departments, the average cost per clinic visit exceeded $5, whereas in others the cost was only $1.60. At all events, patients are receiving excellent medical service for about a third of what they would have to pay to the same physicians at their private offices.

All who know the work of this clinic are agreed that the standard of service is of a high order. This is further indicated by the enthusiastic response the clinic has received from its patients. The average number of visits per case is now close to five, a higher number than is usually paid at other clinics. Patients recommend the service to their friends, and this is largely the source of the new clientele. Physicians likewise refer many of their patients to the clinic. Thirty-five hundred doctors of the metropolitan area have sent more than twelve thousand of their private patients to the clinic for diagnosis and consultation, and this type of service for private physicians is constantly increasing. The Cornell clinic has established itself as an indispensable part of the medical equipment of the city. Its demonstrated efficiency in caring for cases which ordinarily would be difficult and expensive to treat will undoubtedly have a very large effect in further extensions of similar service the country over.

v

A similar method of supplying effective and economical medical service is the development of student health work in American secondary schools, colleges, and universities. Many educational institutions are located in small towns where private medical facilities are inadequate to care for the large number of students. The school authorities have, therefore, found it necessary to provide facilities of their own, using largely the excellent personnel and medical equipment of their own medical faculties. Such service is now very widely available; perhaps the most interesting examples being found in the Universities of California, Michigan, and Minnesota, each of which cares for about ten thousand students.

In these institutions, the service is all-inclusive. The incoming students are carefully examined and receive advice as to their physical condition, what exercises to take, and how they may keep well. When a student is sick, he is encouraged to come to the clinic for the examination and treatment of even minor affections. If the ailment is serious, or if it be a source of danger to others, the case is at once hospitalized and treated for a sufficient length of time by the most approved methods. There can be little doubt that the service is of the best type and that the students are kept in excellent physical condition.

What interests us particularly in these demonstrations is the very low cost of the service. Dr. Sundwall,

describing his work at Ann Arbor, says that each student is taxed $6 a year for health service and that this amount is adequate to cover medical and nursing expenses, together with the cost of equipment. This small sum is also the amount of the annual fee per student at the University of Minnesota where an excellent service is rendered. The fee will be increased to $9 with the new semester. At the University of California, the actual cost of the service is more nearly $12.30 a year.

These college health organizations prove that a reasonably complete medical service can be rendered at an extraordinarily low cost. The small fees in the above universities cover virtually everything, including drugs, laboratory tests, examinations, and hospital care. At California, the only additional charge is apparently a low and uniform fee for surgical operations. At Minnesota, small additions are charged for dentistry and a few other items. At Ann Arbor, the average cost of a clinic visit is only eighty-five cents; at California, it is only a little more. Hospital care costs the college about $2.50 a day.

The movement for good medical service is spreading to students at most American colleges. More and more colleges are supplying this service for students at low cost. In a few institutions the faculty members are receiving similar care, and in a few others a movement is on foot to make the service available to families of the faculty. These experiments will have a definite bearing on the problem of the cost of medical

service. Their appeal is not only because of low costs. The service rendered is of a high order and at the same time democratic, eliminating the distinctions which ordinarily follow differences in economic status. The poor and the rich pay the same fees and receive identical treatment.

VI

There is little general appreciation of the extent to which medical service has been provided by industry for its workers and the number of employers who have found it to their advantage to organize medical departments.

In the beginning, a few progressive firms established dispensaries for employees injured in the course of the day's work; but the presence of a physician and a nurse in a plant, almost of necessity, resulted in extensions of the service. The passage of more stringent compensation laws which penalized employers heavily for industrial accidents and diseases likewise influenced this development. The industrial physicians began to examine applicants for employment and at regular intervals thereafter. In many cases they found physical defects which could be easily remedied. Since this could not always be accomplished by the workers themselves, many employers offered facilities for securing and guiding the treatment, hoping in this way to prevent the physical breakdown of their workers. An important factor in the growth of this

movement has been, on the whole, its favorable reception by the workers.

The theory and practice of medical service in industry is that both the employer and employee are mutually benefited by keeping the worker in good physical condition. A liberal interpretation of this idea results in services which not only take care of obvious physical disabilities but also disclose incipient conditions while they can still be corrected. The actual responsibility for such remedial work usually rests with the employee. Industrial medical service will cost the employer something like ten dollars per capita per year, although the sum cannot be definitely fixed, as it will vary considerably from industry to industry and from plant to plant. Generally speaking, it does not appear that the standards of service are low because of this small cost. Economy results from the employment of full-time medical attendants, from the continuous use of equipment, and from good supervision.

Some industrial organizations carry their medical service still further. A few have built hospitals where employees receive treatment at small cost. In some plants the employee is charged a small annual sum which entitles him to general medical care when necessary. In a few unusual cases the members of the worker's family are included in the medical service which covers even confinement care, infant health supervision, the protection of children with toxin-antitoxin, and even school health work. Such fairly com-

plete medical service for workers and their families in one large plant costs about $30 a year per employee. In most other establishments it would cost considerably in excess of this low figure. Such service can be undertaken only in isolated communities where the industry is the controlling factor in the life of the people.

Granting the rarity of these inclusive services, the great run of industrial medical departments serve workers economically and efficiently. Millions of people are benefited to a greater or lesser degree through these agencies. Millions of dollars are profitably spent in this way to safeguard the health of wage-earners. Wherever effort has been kept within modest bounds is has rarely met with the opposition of the medical profession. Lesser afflictions and complaints which otherwise would not have received medical attention at all are now cared for, and many serious conditions which would have been undiscovered until too late are now brought to light and called to the attention of private practitioners. Industrial medicine, in this way, has served to bridge the gap between wage-earners and the medical practitioner.

VII

What remedies can we propose for the high cost of medical service? We have already discussed some suggestive developments which promise relief. Group medicine, through the organization of physicians into

effective working units, will undoubtedly eliminate much of the waste of current individual practice and reduce the cost to the patient. The near future will undoubtedly see many more pay clinics patterned after the Cornell University model. These will serve for the diagnosis and treatment of obscure ailments and will be well adapted to the financial ability of many middle-class patients. But for the treatment of illnesses occurring among wage-earners and their families there will be need for still greater development of out-patient departments of hospitals. Such clinics will charge larger fees than at present to cover the entire cost of operation, including the adequate compensation of physicians on the staff. For the service of bed cases, hospitals will in like manner work out a plan for domiciliary service adapted to patients of moderate means. The success of such plans will depend a great deal upon further reduction in the amount of free service rendered by hospitals. In fact, free service must be entirely eliminated as a factor in hospital management. The cost of service for the destitute must be met in the future through public funds; but the amount of such relief ought never to be large in America. Finally, industry and business will still further serve their personnel along medical lines which experience has proved to be sound. These developments are distinctively American in origin and well adapted to our temperament and our genius for organization.

But there is another equally important remedy which

even if it does not reduce the cost of medical treatment will assure funds with which to meet medical bills conveniently when serious and expensive sickness occurs. It is not concerned with medical organization—whether doctors work privately or in groups. It does, however, supplement group organization of physicians with group organization of patients. By this means, people in vast numbers join together and by the payment of fixed premiums while they are well provide a fund adequate to pay sickness costs. This is essentially health insurance—the best method yet proposed for meeting the cost of disabling sickness. There are fortunately enough private insurance companies in the United States able to conduct this type of business both efficiently and economically. In fact, many persons in comfortable circumstances are now carrying sickness and accident insurance in existing insurance organizations. A half million American wage-earners are now covered by group health insurance contracts in strong life insurance companies, and possibly several million more are affiliated with lodges and mutual benefit associations which to a greater or less degree provide medical service. The solution of the economic problem we have been discussing will come only when sickness insurance becomes as popular among workingmen and their families as industrial life insurance is now. Such a system will leave people entirely free to choose their own physicians just as they do now. Doctors will likewise benefit; for under this plan they will be assured of compensation for services rendered.

The cost of such insurance, if limited to cases of serious illness involving disability, will not be excessive. Nondisabling ailments, although of frequent occurrence, do not lend themselves to insurance coverage. The mechanics of handling enormous numbers of claims for petty amounts would add heavily to the cost of the insurance and could, therefore, be of little advantage to the patients. It may be good practice in the early stages of this development to scale premiums down to cover only from two-thirds to three-quarters of the actual present cost of medical service in serious cases. The cost of such health insurance would be still further reduced and brought within the means of virtually all families if it could be written on large numbers of persons at one time (group or wholesale insurance). This is not the occasion, however, for a detailed outline of such a health insurance system. It is sufficient for our purpose to say that the cost of such insurance will be well within the means of the American people. The insurance machinery now available will run smoothly in administering this system. Only a nation-wide educational campaign is necessary to popularize such a plan. When this has been successfully consummated, the menace of the present situation in which only the very poor and the very rich can obtain medical service without worry will be ended.

It is not difficult to foresee what the reaction of physicians will be to the above suggestions. The method of insurance protection to cover the cost of

medical care will, I believe, be welcomed by the rank and file of physicians, for this will benefit them by assuring full compensation where there is now so much uncertainty and delay in payment of the larger bills. It is even conceivable that the profession will lend its organized support to furthering such business arrangements, provided it can be assured that there will be no curtailment in the personal relationship between physicians and their patients. But the suggestion of group medicine has never been favored by many practitioners, and it is not expected that it will now be accepted with any joy. There is much justification for such an attitude. It is difficult to expect doctors to be among the first of the professions to adopt standards of compensation which emphasize community rather than personal advantage.

Nevertheless, I believe that group medicine will have no adverse effect on the finances of the medical profession. It will not result in any lessened demand for the doctor's services but should rather increase the amount of his work. Thousands of people who now find it difficult to consult physicians because of the expense will find in the pay clinic a ready means for doing so. The propaganda for periodic health examinations will work in the same direction; for the clinic is especially adapted to render this type of service. It is to be expected that under such extension of group medicine doctors will devote much of their time to the clinic—but they will be well paid for their service. There will always be a large number of people, how-

ever, who will insist on the old-time intimate relationship existing between doctor and patient. Patients confined to bed will also require individual care. The private practice of medicine, even if somewhat curtailed, will always remain indispensable. But the time devoted to private office practice should, under the new conditions, be paid for on a more lucrative basis than at present. It will then be pertinent to determine what a fair charge for this highly individual and private service is. A scientific determination of the charges will involve evaluation of such items as the cost of the doctor's training, the cost of his equipment and overhead, the time that he has available for private patients, having always in mind the standard of living which the community expects him to maintain, and a margin sufficient to provide for reasonable leisure and the protection of his old age. There is altogether too much guesswork at the present time about all these factors. Such an evaluation conducted along scientific lines would be a first-class contribution to the solution of the economic problem of medical practice.

CHAPTER III

WHAT IT COSTS TO NEGLECT OUR CHILDREN [1]

IT IS an astounding fact that as a nation we neglect the health of our children on a huge scale. In spite of our boastful assurances that nothing is too good or expensive for them, we are really very niggardly in our provision for their welfare. A careful study made a few years ago by a group of health experts working in coöperation with the U. S. Public Health Service showed that even in our large and prosperous cities where the health departments are most developed we are spending only fifty-nine cents a year per capita for what may be classified as child health work. In the smaller towns and in the rural areas, where half the population of the country still lives, we spend very little indeed for such service. A total of about forty millions of dollars a year, a little over a dollar a year per child, more than covers what we give, through community agencies both public and private, for the protection of child life and health. This amount covers such activities as have been developed to protect infants, to prevent the communicable diseases from spreading among toddlers before they get to school,

[1] An address presented before the American Child Health Association, Washington, D. C., May 10, 1927, and printed in *Revue Internationale de l'Enfant,* July-Aug., 1927.

the medical inspection of children at school, and a share of the other health services which are intended to care for children.

How different is the situation with reference to public education in the United States! In this field we are not a bit parsimonious. From the very beginning, our people have believed in education and have been willing to tax themselves heavily that their children might receive what they thought was the best. The cost of education in the United States is now well in excess of two billions of dollars a year, or fifty times as much as for child health work. The cost per pupil averages over a hundred dollars a year. In the larger communities, this cost per child is considerably higher. Parents in better circumstances who provide for the education of their children through private channels spend four or five hundred dollars a year and look upon this expenditure as a good investment.

Yet, if anything, the protection of the health of children is more fundamental than the development of their education. The healthy body determines the healthy mind. But as a nation we have not yet learned to carry over a liberal and constructive attitude toward the conservation of child health. We appear too ready to forget the many hazards to which children are exposed both from disease and from accident; to disregard the effects of malnutrition and the numerous other incidents that stultify the growth of children. Our neglect results in rearing persons who, however well educated, are incapable of the best life either

as individuals or as citizens. What sense is there in spending a hundred or more dollars a year per child for education and then neglecting to spend a few additional dollars which would make it possible to reap the full advantage from the educational process?

The development of the public-health campaign has demonstrated without question that there is an immense amount of preventable sickness and death and that this constitutes the chief source of individual misfortune and community waste the country over. We would be an immensely richer and happier nation if we could prevent this unnecessary drain on our vital resources. Every year our sickness bill in lost wages, in reduced production, as well as in the necessary care of sickness, amounts to a total of two and a quarter billions of dollars and, if we were inclined to include the value of the human life we lose through premature death, this amount could be increased by six billions more a year. But it is especially at the children's ages that the greatest amount of sickness and preventable death is concentrated. It is in the first day, in the first month, in the first year, and in the first ten years of life, that the greatest losses occur. The human animal is weakest at the beginning, and it is there that we must concentrate our effort to prevent the greatest losses. Hesitatingly we spend forty millions a year, and largely waste it, in an effort to stem a loss of many billions which a more adequate expenditure of money and effort would largely accomplish. We are, as a

people, penny wise and pound foolish in our policy of neglecting the lives of our children.

II

Let us see what the situation actually is with reference to preventable sickness and death among children. Only a quarter of a century ago about 17 per cent of all babies who were born died before they were a year old. One out of every six never reached its first birthday. At the present time infant mortality has been reduced to only 7 per cent, or considerably less than half of what it was only twenty-five years ago. This is a great achievement. But, unfortunately, this figure of 7 per cent is only an average for the country as a whole. There are many communities that have lower rates and many that still have very high rates. Thus, in 1925, a survey by the American Child Health Association showed that 90 out of the 697 cities reporting had infant-mortality rates in excess of 10 per cent a year. On the other hand, there were 8 communities with rates as low as 3.5 per cent and 70 cities with rates under 5 per cent per year. The cities on the Pacific coast—San Francisco, Seattle, Portland, and Oakland and others—show by their very low infant-mortality rates how favorable conditions for infants may be made. And there are many Eastern cities that do almost as well. Bridgeport and New Haven in Connecticut, Cambridge and Newton in Massachusetts, Mount Vernon and New Rochelle in

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New York, the Oranges in New Jersey, prove that, in spite of less helpful climatic conditions in the North-eastern cities, infant life can be safeguarded, and that year after year infant-mortality rates between 4 and 5 per cent of the births can be achieved. I have no doubt at all that if the public-health and medical knowledge which we now have were made available more widely to mothers during their child-bearing period, the infant-mortality rate could be reduced to well below 3 per cent per year. Such an achievement would reduce the number of deaths of infants in the United States in any year from 180,000 which still occur to a little over 70,000, or a clear saving of 110,000 babies each year.

After the infant has passed through the dangers of the first year, it is still exposed to any number of hazards in the second year, and to a lesser degree until it reaches age five. The earlier years of schooling present their difficulties, and there are serious hazards to be considered even for the young adolescent up to age fifteen. In the course of the last twenty-five years the mortality of children from one to four years old has declined from 21 per 1,000 to a little over 6 per 1,000, or about 70 per cent. The mortality of children between five and nine years old has declined from 5 per 1,000 in 1900 to 2 per 1,000 in 1925. This can be reduced to one death per thousand. Between ten and fourteen years, the mortality has declined from a little over 3 per 1,000 in 1900 to a little under

2 per 1,000 in 1925, and this also can be reduced to one death per thousand living at those ages.

When communities the country over wake up to their opportunities to control the conditions which are still destroying the lives of children and take advantage of the knowledge and practices which preventive medicine have put at our disposal, the sum total of the reductions in mortality of children will be enormous. I have said that there will be a saving of 110,000 lives of infants. In addition, we may count on 34,000 lives of children between one and four years, close to 11,000 children between five and nine years, and about 7,500 more between ten and fourteen; or counting all of the ages under fifteen, the number of children capable of being saved will total 162,500. This is the stake for which we are playing. The question is, Is this stake worth while? Can we not afford to pay the small price of saving these lives?

III

The very first step in the solution of this question is to determine whether human lives are worth saving and whether disease is worth preventing. I have attempted in another place to calculate the value of human life at various ages. The method was to determine the amount of wealth that human beings at various ages produce in excess of the cost for their birth and their maintenance. The infant just born is an economic asset because it has cost money to bring

him into the world and because if he be allowed to reach maturity, he will produce more than he cost to bring up, plus what it will cost to maintain him. Our wealth is increasing because human beings have the capacity to produce more than they consume. I need hardly go into the details of the method. According to our calculations, the American boy at birth is valued in excess of $9,000. At age five the corresponding figure is over $14,000, and at age fifteen, in excess of $25,000. These figures were calculated on the assumption that the children would ultimately be found in the average economic class—that is, among those who at their maximum earn about $2,500 a year. The figures for girls are assumed to be half those for boys at the same ages.

We now can estimate the cost of our preventable child mortality. The wastage of children under one year old brings about a loss of over $750,000,000 a year, and of children under fifteen years of age the loss reaches the astounding total of $1,650,000,000. This is the amount which the country would ultimately gain were these lives saved and allowed to reach maturity and play their part in the nation's work. By the cold test of dollars and cents, child life is not cheap in America.

It is more difficult to make specific calculations of the cost of preventable sickness in infancy and childhood because of the almost complete absence of trustworthy records. But we may, nevertheless, attempt an estimate with a measure of safety. Children under-

fifteen years of age constitute about a third of the total population, and we know that they suffer their share of illness. An extensive investigation of sickness occurring in typical American families which was made some years ago showed that about 1 per cent of the children under fifteen were at all times seriously sick. Another investigation more recently made in the city of Montreal gave a higher figure, namely, 2.3 per cent of the children were sick. This figure is equivalent to well over eight days of sickness per child per year. A third study of the cost of sickness prevailing in the families of clerical employees in the city of New York indicated that the average annual expenditure per child was $8.40. This figure may be a little higher than for the country as a whole because of the rather favorable economic status of these employees. But the most conservative estimate of the cost of illness among children cannot be less the country over than five dollars per child per annum. This figure would mean a total of close to two hundred millions a year as the approximate cost of medical, nursing, and other care of children during illness. Every parent knows how great a financial strain is occasioned each year by the recurring illnesses of children.

If we combine the figures of the cost of preventable mortality with the cost of medical care for illness, we reach the enormous total of nearly two billions of dollars a year as the measure of our neglect of child life and health. The most disconcerting part of this picture is that the bulk of this loss is both unneces-

sary and preventable. What excuse is there to-day for thousands of cases of sickness and of death which actually occur among children every year from a variety of conditions which we absolutely know how to prevent? It is a source of bewilderment to me to understand how a nation, whose people are so gifted in business practices as we Americans are supposed to be, can allow such a condition to exist.

IV

What can we do to stop the staggering losses from which we now suffer? The parent, in so far as he acts as an individual, can do little more than repair the damage done by disease. We have already seen the amount he spends in trying to make good such damage to the life and health of his children. But this method of attack is almost hopeless. Most parents are ill informed as to the hygiene of infancy and childhood, and they are unable to cope with the situation which the conditions of life in our cities have brought about. The congestion is so great, the proximity of individuals so continuous, and the opportunities for cross-infection so constant, that the problem of keeping children well is not so much one for the individual parent as it is a community problem for common solution. The keynote in medicine to-day is not cure, but prevention. And if prevention is to be practiced, it must be effected not by the parent alone, but rather through the agreement of parents—that is, by the com-

munity and through its official representatives. This is how the health departments and the nonofficial health agencies have arisen and their functions have been made definite during the recent decades. They act for the group because that is the most effective and economical way to act under present conditions.

A few striking illustrations of the effectiveness of certain organized health agencies, both public and private, in their attack on child wastage will suffice. As I have already indicated, the first year of life is the most fruitful field for labor. It is then that the largest number of children die unnecessarily. It is this wastage that can be stopped. Think of what was accomplished recently through a demonstration lasting little more than three years in the small Canadian town called Thetford Mines. In this French Canadian community of 9,000 persons, the infant-mortality rate in 1920 was close to 300 per 1,000 births, or 30 per cent. A maternity center was established, mothers were educated to take advantage of the facilities offered by the nursing organization; doctors were taught to coöperate; babies were visited and their nutrition carefully supervised. By 1926, the infant-mortality rate had dropped to below 80 per 1,000. This rate is still high. I give it only as an illustration of how easily this loss can be brought under control. There are hundreds of other communities where similar reductions have occurred.

Perhaps the most interesting illustration is the work of the Maternity Center Association of New York

which, some years ago, organized an effort to reduce the mortality of early infancy—that is, within the first weeks and months of life. It was recognized that the deaths from injury at birth, from congenital malformations, and from other diseases peculiar to early infancy had scarcely been touched by the developing public-health program. The Maternity Center Association made available to pregnant women the facilities of its welfare clinics, where qualified physicians gave advice and also sent nurses to the homes for the instruction of mothers in the hygiene of pregnancy. As a result, the rate of premature births was reduced to 4.8 per 1,000 babies born; whereas, in the general population of the city of New York, the rate in the same year was about three times as high. Even better results have been obtained in other clinics, especially when a good obstetrical service was combined with the prenatal clinic care. In Detroit, in 1925, the babies born to mothers who attended the prenatal clinic showed remarkable reductions in their early infant mortality. For these reasons, there is no longer any ground for believing that the deaths in early infancy are inevitable. They are within control, provided mothers receive intelligent care during pregnancy, careful attention at confinement, and the infants receive good care during the first month of life.

After the first year, when the conditions of early infancy, diarrhœa and enteritis and pneumonia, have done their work, such conditions as diphtheria, whooping cough, and tuberculosis, are the principal de-

stroyers. Every one of them is certainly capable of considerable reduction. It has been demonstrated to the hilt that deaths from diphtheria are utterly unnecessary and can be prevented by any community that makes up its mind to do so. The work of Dr. Sears in Auburn has shown the way. In that community of 35,000 they have had four years without a single death from diphtheria, although, prior to the beginning of the intensive work, cases and deaths ran high. In 1922, for example, the number of cases was 97, and the deaths 13. But with the campaign to immunize the child population by inoculating with toxin-antitoxin, the number of cases dropped at once to 47 the next year, and the deaths dropped to 4; and since that time there has been but one death in that entire community. The record of New Haven, a city with a population of over 180,000, is almost as good. In that city there was but one death from diphtheria last year as the result of the campaign of Dr. Rice, the city health officer. Essentially, Dr. Rice's program was very much the same as Dr. Sears's. With the coöperation of the physicians of the city, he has succeeded in immunizing virtually the entire child population against diphtheria, and it is now hoped that for some years to come the excellent record of this city will continue.

Tuberculosis follows diphtheria as the most important of the communicable diseases of childhood. It, too, can be very materially reduced as a cause both of sickness and of death. The very marked reductions

that have occurred in most advanced communities in the number of deaths from tuberculous meningitis is already an excellent indication of what may be accomplished. But tuberculosis of the respiratory system is capable of great declines in so far as it affects children. This fact is amply demonstrated by the experience of Framingham, Massachusetts, where, some years ago, an experiment in health administration was conducted by the Metropolitan Life Insurance Company and the National Tuberculosis Association. While this effort was not directed primarily at the children, they more than any other group profited from what was done in the community. The demonstration set up excellent machinery for the physical examination of old and young, provision for school health work was made, and a campaign of education was launched for instructing the entire community in the dangers from tuberculosis, especially. I am privileged to present here some as yet unpublished results that have followed this activity. Dr. Chadwick of the Massachusetts State Department of Health, having recently surveyed Framingham among other Massachusetts communities, reports that while for the state as a whole the percentage of children classified as having glandular tuberculosis ranges from 3.3 to 5 per cent, only 2 per cent of the children in Framingham have this condition. The most remarkable fact is that the present survey found only one case of pulmonary tuberculosis among children in the schools. Only 26 per cent of the children from five to fifteen showed

positive tuberculin tests, an extraordinarily low record. An x-ray study of 347 high-school pupils showed not a single case of pulmonary tuberculosis or any other disease of the lungs. While it is a far cry from Framingham to most other communities of the country in respect to the extent of public interest, the results of this demonstration are, nevertheless, capable of general repetition, provided the work is undertaken and carried out with the same degree of intelligence and thoroughness as has characterized the work in Framingham during the last ten years.

V

Let us return to the question of cost. How much are we now spending for the conservation of child life and how much would it be necessary to expend to do the work in a satisfactory manner? I have said above that as a nation we give about a dollar a year per child to the public and private agencies concerned with child conservation. This is inadequate to achieve its purpose. Our health agencies suffer not only from insufficient funds, but also from bad organization. It is only too apparent that in most American communities they are altogether too often insufficiently manned, the workers too little trained, suffer from insecure tenure, and do not have the necessary assistance of nursing and other personnel to carry on their work. The interest and enthusiasm of the mothers of the community which could be enlisted to coöperate with the health

workers for the care of children are neglected because there is no one competent to carry on a campaign of public-health education. It is only here and there that the right way has been shown. The remarkable results achieved in Framingham followed more from good management than from large appropriations. In this community, less than $3 per capita is now being spent for all types of health work, and possibly not more than $1.50 per capita covers what is necessary for its protection of children. This is equivalent to about $4.50 per annum per child. Expert health administrators are agreed that such an expenditure, if properly administered in a well-organized department, would serve to carry on the activities for child welfare in an effective manner.

But what an absurd contrast between these minimal sums of what is required per capita to conserve child life and the value of the child when its life and health are endangered by our neglect. An expenditure of $4.50 per child would mean a total expenditure of $180,000,000 throughout the country for the care of child life. To-day, the loss from child sickness alone is more than this sum, and that of preventable death more than ten times as much. We are as a nation spending about forty millions through our various official and voluntary agencies, national, state, and local, for the conservation of child health; and because this sum is inadequate we are wasting a good part of it. We must learn how to increase our expenditures for this purpose about fivefold. This, then, is my

answer to the question at the head of this paper, namely, What does it cost to neglect our children? It does not pay to neglect them. It does not pay morally; it does not pay financially. If we were moved only by the crudest and coldest calculations of dollars and cents, we could not afford to neglect our children. From every angle, they are the most valuable assets we have. Every penny we spend along approved lines will bring us returns literally tenfold, and satisfactions of a spiritual order which are beyond measure. This is the lesson we can gather from the study of our past experience, from our failure to do the obvious things in our rich country. There can no longer be any excuse for continuing the disgrace of the neglect of our children.

CHAPTER IV

THE PROBLEM OF HEART DISEASE[1]

TWENTY-FIVE years is a short time as we count human affairs; yet, in this brief space, a revolution has occurred in the hazards to life and health. The change has passed almost unnoticed. The discoveries of modern medicine and the development of the public-health movement have brought one infectious disease after another under control. The ravages of typhoid fever, yellow fever, cholera, diphtheria, scarlet fever, and infantile enteritis have been checked and are now, in the most advanced countries at least, well on the road to extinction. Tuberculosis, which a quarter of a century ago was the leader among the destroyers of life, has been reduced more than 50 per cent. It is now relegated to fifth place in the list of causes of death. As a result of this progress, more than ten years have been added, in this generation, to the life expectation of the whole people. A new order of vigor prevails to-day in the civilized world. Men are able to live and work more freely, unhampered by the fear of premature death. Life is safer and easier and, for that very reason, is economically more productive. In the struggle to overcome the bacterial

[1] Printed in *Harper's Monthly Magazine*, Jan., 1927.

enemies of mankind the outlook has never been more promising.

These victories have brought into relief hazards of another sort. The control over the external infections has resulted in a greater interest in the defects of our internal organism. To-day the emphasis is shifting from the infectious diseases of youth to the degenerative conditions of middle life, such as heart disease, the hardening of the arteries, Bright's disease, the nervous disorders, and cancer. There is good evidence that these conditions, taken together, are increasing. It is entirely possible that the way we now live has a good deal to do with the situation. The crowding of immense populations into the cities, their intense and noisy activity, the drive for money and for the excitements which money supplies are certainly not conducive to orderly and reposeful living. Leading psychiatrists have stressed the possibility that the new ways are injurious to our nervous organization, and some of them believe that they may predispose to the degenerative diseases. But we really know very little in regard to this relationship. Much remains to be discovered in this field of medicine. In any case, it is time that the public interest should be directed to what is happening. The present trend of the more important of this group of diseases should be more generally appreciated. This is a first requisite to any steps that may be taken to check their effects.

Heart disease is now the first in the list of causes of death. It is also first in the amount of damage it

does through producing disability and invalidism. In the United States the deaths of nearly two hundred thousand persons are ascribed to it each year. If the present situation should continue unchecked, one in every five of the population now living will eventually succumb to this disease. At age ten one is three times as likely to die eventually from it as from tuberculosis. A man at thirty is four times as likely to die of heart disease as from tuberculosis; and for a woman the probability at that age is more than five times as great. If these deaths from heart disease were limited to old people, one could hardly complain; for this mode of exit is as good as any for those who have rounded out their life work. But, as we shall see more fully later, the deaths from heart disease are not limited to the aged. There are all too many young and middle-aged victims whose premature death is often preceded by long periods of disability. For every death from heart disease that occurs annually, there are probably ten persons living impaired and deficient lives because of the breakdown of heart function. Altogether, two million people in the United States, or about 2 per cent of the entire population, suffer from some form of heart trouble; many of them cannot engage in productive activities and are, to a greater or lesser degree, a drain on the resources of the people. Proper medical and nursing care of such patients is expensive. There is to-day no more fruitful source of impoverishment and family breakdown. The annual reports of our charitable organizations show strikingly the prom-

inence of heart disease as a primary cause of dependence. It has more than replaced tuberculosis, which is being relegated to a position of decreasing importance. The economic loss to the community from heart disease is enormous. I consider the problem involved an outstanding one in contemporary medicine.

II

In discussing heart diseases we must remember that they are not the result of one, but of a combination of many factors and related disorders. The heart is a complicated organ. Essentially, it is a muscular pump composed of four chambers and their incoming and outgoing blood vessels. The action of these chambers is coördinated and controlled by an intricate nervous mechanism. The chambers are paired into a right half and a left half. The upper chamber on each side is called the auricle; the lower, the ventricle. Each auricle is separated from its ventricle by a muscular valve which permits the flow of blood downward but prevents the leakage of blood backward. Venous blood arriving from all parts of the body in the right auricle passes from the auricle through the valve into the right ventricle. It is then pumped through the pulmonary arteries to the lungs where it is aërated. The blood then returns to the left auricle, passes down through the valve on that side into the left ventricle, whence it is pumped out through the aorta to be distributed to all parts of the body.

This complicated pumping mechanism may get out of order in many ways. A group of very common heart disorders arise from difficulties outside of the heart itself. These are the so-called *functional* cases. The nervous mechanism which regulates the heart action may be temporarily and slightly deranged, producing heart symptoms without causing structural changes in the heart. Emotional states and severe bodily exercise will increase the demands on the circulation and overstrain the heart. The symptoms in such cases are sometimes very distressing, but usually are of no very great importance. If they are allowed to continue for long periods of time, however, these functional disorders may result in permanent heart impairment. The cases of so-called *organic* heart disease, on the other hand, reflect conditions within the heart itself, and are much more serious in character. Disease of the heart valves is lamentably common, usually the aftermath or an accompaniment of disease elsewhere in the body, such as scarlet fever, serious dental infection, tonsilitis, or acute rheumatic fever, more rarely syphilis. It is estimated that acute rheumatic fever alone is responsible for 25 per cent of all cases of heart disease, and that syphilis accounts for 10 per cent more. Rheumatic heart disease is usually acute, occurs in early life, and more often affects the valve between the auricle and ventricle on the left side. Syphilitic heart disease, on the other hand, is much more chronic in character, occurs among persons between forty and sixty years of age and affects the

aorta or the aortic valve. The affected valves in such cases become scarred and deformed and no longer function perfectly. The inflow of blood from one chamber to another may be impeded, or an incompletely closed valve may permit blood once through to leak back into the chamber whence it came. Obviously, to meet the body's needs, the heart must increase its labors under such conditions and, ultimately, the muscle will become exhausted. Frequently, valvular disease is accompanied by certain sounds called "heart murmurs."

The most common form of heart trouble is associated with hardening of the arteries or with elevated blood pressure. Forty per cent of all heart cases are of this type. The arteries are normally elastic tubes, expanding and contracting, and thus aid in the distribution of the blood. As they become hardened, there is an increased resistance to blood flow and, as a consequence, more work for the heart. The hardening of the arteries may take place in the muscular walls of the heart itself, thus impairing its nutrition. Bright's disease, in much the same manner as arteriosclerosis—perhaps together with it—may increase the load upon the heart and predispose to ultimate disaster. The enlargement and the degeneration of the heart muscle are the physical signs of this type of disease. The valves are usually not involved at first. The disease is chronic in character and occurs, for the most part, in persons after age fifty. A variation of this class of case is that found in old age. The senescent heart, even without any local disease process in the muscle

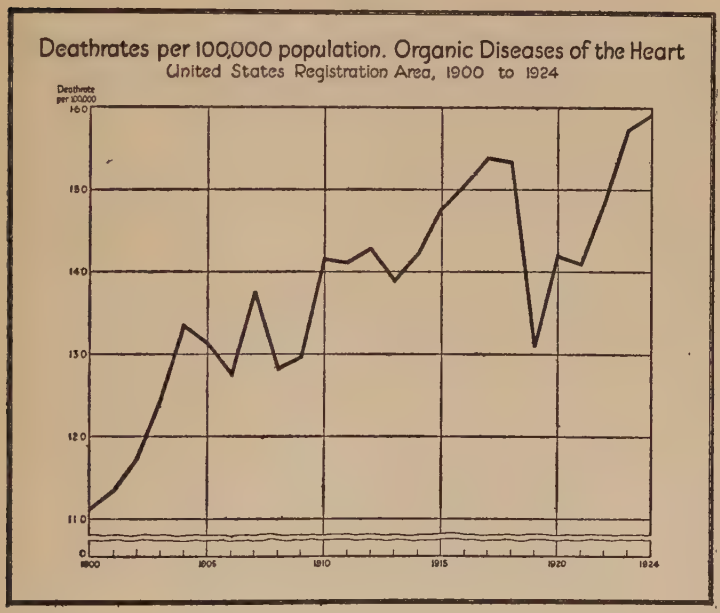
or valves, is not able to function properly. The origin of about 10 per cent of the cases of heart disease is still unknown. In the remaining 15 per cent of the cases, the cause may be one of a number not so easily classified. They include such cases as result from certain excesses, such as alcoholism, or from an attack of goiter, and from a number of other primary disorders.

These are some of the commoner ways which lead to cardiac failure. The trained physician can usually determine whether there is any considerable enlargement of the heart muscles by the physical examination of the chest, supplemented by means of fluoroscopic or x-ray pictures, and can determine the particular lesion by the unusual sounds or murmurs heard in the heart as the blood flows through from chamber to chamber. The subjective symptoms which the patient brings to the attention of the physician are of the greatest importance in leading to a diagnosis. By means of an instrument of precision, the electrocardiograph, the heart specialist is able to diagnose more accurately still the particular defect which exists, even in its very early stages. Finally, by the actual test of the heart's ability to tolerate standard types of exercise, the skilled physician is able to determine the amount of the heart's disability.

The first question for the vital statistician to answer is whether heart disease as a cause of disability and death is now actually increasing or decreasing. We must examine the crude death rates over a period of years. In 1900, when the earliest reliable figures for

the United States Death Registration Area became available, the rate was 111.2 deaths per 100,000 of population. This means that one-tenth of 1 per cent of the total population died from this cause during the course of a year. Between 1900 and 1910 there was

Chart I.



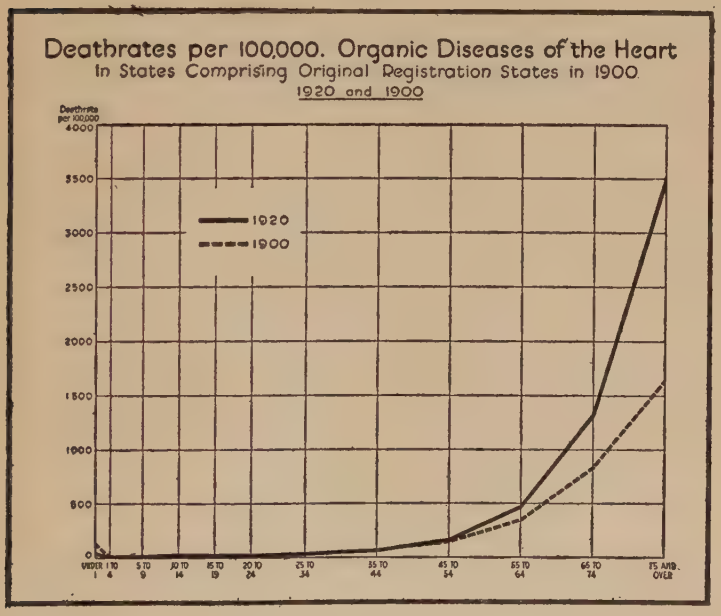
a continuous rise in the rates, the figure for 1910 being 141.5 per 100,000. In the decade beginning with 1910 the rates were first fairly stationary and then rose regularly up to the war and influenza years, 1917 and 1918, when figures above 153 per 100,000 were reached. Following the influenza epidemic, the three years 1919, 1920, and 1921 were years of compara-

tively low rates. There is every indication that this decline was, in large measure, the result of the epidemic itself. Physicians everywhere noted that influenza was very often fatal to those who had been suffering from serious heart affections. Many died of influenza in 1918 and 1919 who, in the ordinary course of events, would have died two or three years later from their heart disease. Since 1922, the rate has been rising slightly each year, bringing the figures back to what they were immediately before the influenza period and even beyond.

The general impression given by these figures and which is confirmed by the graph, is one of increasing heart disease incidence during the last twenty-five years. But this rough method of analysis is subject to very decided limitations. Heart disease is preëminently a condition of the older ages of life, and it may well be that such increase in the number of deaths as has occurred has resulted not so much from an increase in the hazard from heart disease as from the shifting of the age distribution of the population. In recent years more people have reached the older ages when heart disease is more likely to occur. The gradual reduction in the death rate from such diseases as tuberculosis, pneumonia, and the other infections has transferred many additional persons to the later age groups. It is then that heart disease is most frequent. Under conditions of twenty or thirty years ago, many of these people would have died in early life. Today they survive to middle life and old age and then are much more likely to develop a heart defect and to

die of it. Our first question, accordingly, resolves itself into a second, namely: "Is the hazard of dying from heart disease actually increasing at the various ages of life as well as during the aggregate life span?" This question can be answered only by reference to certain figures which we call age-specific death rates.

Chart II.

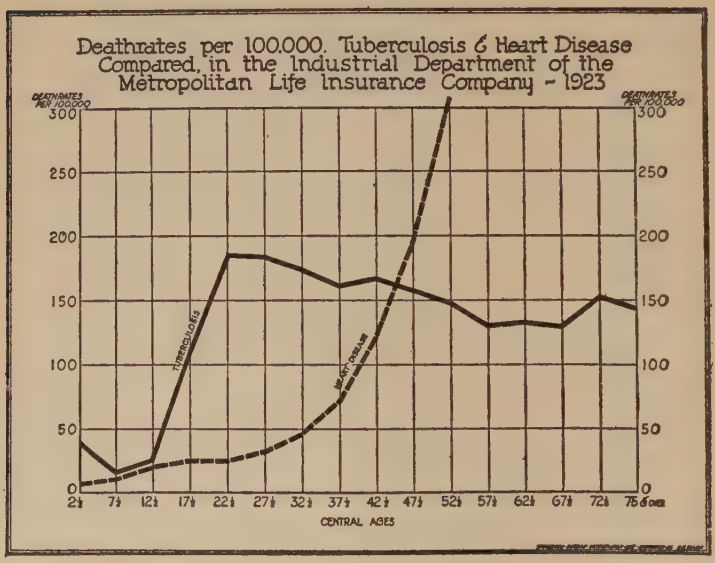


These tell us the probability of dying from heart disease during the specific age periods in question.

A comparison of the age-specific death rates of 1920 with those for 1900 shows at once a number of interesting items. Among young children under five, the rates declined considerably during this twenty-year interval. Between ages five and forty-five the

specific death rates remained unchanged. Conditions, to be sure, varied somewhat from year to year, but taken all together, the disease was *in statu quo* over this period of life. One in every seven deaths from heart disease still takes place among persons under age forty-five. It may be interesting at this point to contrast

Chart III.



the contour of the age curve for heart disease with that for tuberculosis. The latter disease under present conditions shows its maximum at or about the age of twenty-five and then declines with advancing years. The curve for heart disease crosses that for tuberculosis at about age forty-five and then mounts to its huge maximum at the oldest ages. After age forty-five the rates were uniformly higher in 1920 than in

1900 and the excess of 1920 over 1900 is greater with each advancing age period. After age seventy-five the 1920 figures were 114.8 per cent higher than in 1900. Among both men and women the increase in the total rate in recent years has been the result of the marked changes in the death rates at the older ages, beginning at forty-five or fifty years. Not only do more people die from heart disease because more arrive at the older ages, but also because there is an increasing hazard of dying from heart disease in the later ages of life.

III

It should be of some interest, then, to determine under conditions as they now exist what the probability of dying from heart disease actually is. The real question is, "What is the chance that an ordinary man or woman will die eventually from heart disease?"—and this question cannot be answered as easily as it seems. However, calculations have been made, and the reader may be interested in the underlying principle of the method used. We begin with a group of 100,000 persons at a fixed age, let us say age ten. We keep in touch with these people, recording their deaths as they occur until all have passed away. We note also in each case what was the particular cause of the death. We thus learn how many persons in the group die at each year of age after ten. If we sum up the number of deaths from heart disease from age ten onward to the end of the life

table and divide by the total number of persons in the group, we obtain the measure of the probability of dying from heart disease. For example, if we begin with 100,000 boys at age ten, we should find that ultimately there would be a total of 19,218 deaths from heart disease before the entire group had passed out of life. This means that for a boy ten years of age there are nineteen chances of dying eventually from heart disease as against eighty-one chances of dying from some other cause. In the same way, the probability of dying from heart disease can be calculated at any other age. We find, for example, that for this particular disease the probability of dying eventually from it increases slightly from age ten onward. At fifty the probability is 22 per cent; at seventy it is 24 per cent. In other words, virtually one out of every four persons at age seventy will die from this cause. The figures for girls are approximately the same. The probability of dying eventually from heart disease is one in five at age ten, and a little less than one in four at age seventy. It will now be possible to see what has actually happened in the last fifteen years; for in 1910 the probability at age ten of dying eventually from heart disease was only 15 in a hundred. In other words, there has been an increase in the probability of 31 per cent during this short interval. At age fifty the probability of dying ultimately of heart disease in 1924 was 26 per cent higher than in 1910, and at seventy the increase was 26 per cent. These figures better than any at our disposal indicate how

great is the budget of heart-disease mortality at present. No other disease or condition shares its primary position when studied from this angle.

Another interesting statistical comparison relates to the incidence of heart disease in the several races that compose the American population. The most striking difference is shown by the white and colored races. During the main age-periods of life the rates for colored people are about twice those for whites at the corresponding ages. It has been suggested that the higher prevalence of such diseases as malaria, typhoid fever, and especially of syphilis, plays an important part in creating this excess of heart disease among the colored people. The lower standards of personal hygiene and the more difficult conditions of life of this race are clearly important items. There are also marked differences in the amount of heart disease prevailing among the various nationalities that make up the white population in our country. Those of foreign birth divide into two groups: those with a low and those with a high incidence of heart disease. Those of native birth are intermediate between the two foreign groups. The favorable foreign stocks include those born in the former Austro-Hungarian Empire, the Russians (mostly Jews), and the Italians. These are the newer immigrants of eastern and southern Europe. The stocks with high heart disease rates include those born in England, Scotland, and Wales, Germany and Ireland. The figures for the Irish are particularly high, recalling those for the colored peo-

ple rather than for any white group. Why this should be so it is difficult to say. No such unfavorable conditions occur among the Irish people in the old country. But they are uniformly bad among the Irish in America. It will be an interesting study in future years to determine whether the descendants of Irish immigrants are able in their own generation to overcome this handicap of their parents and grandparents and to approximate the better conditions prevailing among Americans of other racial origins.

But, irrespective of race or group, the figures for heart disease are as engrossing as any we can present to-day. No other disease in the entire field of medicine, with the possible exception of cancer, offers so large an opportunity for life-saving service. It is too true, however, that the medical profession and their allies, the public-health workers, have only recently become concerned over the hazards of heart disease and have taken the public into their confidence in developing a program of relief. What can, in fact, be done in the present state of our knowledge to bring this condition under some control? The answer must in the nature of the case be somewhat cautious and conservative. The campaign is at its very inception. We shall be better able to define the issues and to move more quickly as the program is tried out. The experience that the public-health workers have gathered in their attack on other conditions, especially tuberculosis, will prove of great service in the campaign against heart disease. At the very outset two lines of attack present

themselves. The first affects the individual; the second concerns the community as a whole. Each has its proper place. No great headway will be made until the two programs are thoroughly coördinated and put into operation with a full measure of public support.

The campaign as it concerns the individual reduces itself largely to one of personal hygiene. We must, all of us, so live as to avoid heart impairments. More definitely, this means that children must be protected against the infections which often bring heart disease in their train. Unfortunately, we do not yet know the true cause of rheumatic fever, an arch enemy of childhood. But we can prevent and give adequate convalescent care to many cases of tonsilitis and sore throat which appear often to bring on rheumatic complications. The prevention of cases of typhoid fever, of diphtheria, and of scarlet fever through specific inoculation of children against them will cut down a proportion of heart sequelæ. Among young adults the reduction of syphilis will have its effect in fewer heart cases later in life. Saner and more temperate living on the part of all, with due regard to rest and exercise, will result in healthier bodies better prepared to avoid heart impairments. But probably the most potent of all personal efforts will be the development of the habit of the annual medical examination. The periodic health examination is the key to our problem so far as the individual is concerned. This rule applies equally to children as to adults. It is a striking fact that most persons who have heart disease have

discovered this in the most accidental and casual fashion. Usually the cases are found as the result of a life insurance examination or through the health examination of children at school, or by industrial physicians in examining applicants for employment. Usually between 1 and 2 per cent of all such examinations result in the discovery of unmistakable heart disease. The great majority of those who are found to have a heart lesion of one kind or another have not been aware of it. On the other hand, those who believe they have heart disease and go to doctors to have their suspicions confirmed are usually in error. I have no doubt at all that if periodic health examinations become the rule in the United States tens of thousands of persons would be discovered every year with early cardiac defects when it would still be possible to remedy the situation. Changes of habit or of occupation are often sufficient to keep an early lesion under control, certainly for long periods of time.

The contribution the community can make is likewise many sided. The first step is to spread the knowledge of right living; to inculcate good habits of life through the agency of the schools and the other channels of public education. The public schools are in a particularly strategic position. They can discover the large group of children who are predisposed to heart disease and can provide for them a special regimen of instruction and of care which will serve to protect them from further deterioration of their heart structure. As in the successful campaign against

tuberculosis, the organized health agencies of states and cities must provide heart clinics with skilled examiners and adequate equipment to help discover and treat cases of this disease, especially among adults. New York City, stimulated by the wise counsel of the Heart Committee of the New York Tuberculosis and Health Association, has taken the lead in such activities. There are now forty-seven heart clinics distributed over the city. It is not at all surprising that these are crowded, with an ever-increasing number of patients. In the year 1925 there were about twelve thousand active patients under care in these clinics of New York City, fully as many as there were receiving care in the much older tuberculosis clinics of the city. Young people for whose relief there is much hope constitute a large number of the patients, as might be expected. The clinics serve as centers of supervision and instruction and as exchanges for the distribution of patients to those agencies that are best adapted to keep them.

Sanatoria and convalescent homes are especially necessary in the attack on heart disease. For in this disease there are periods of acute outbreaks when the patient must receive intensive care and complete rest before he can be released to his family or his work. And, what is equally important, suitable work must be found for such patients if they are not to slip and become helpless cripples. Only the organized agencies of the community can provide such service. Fortunately, most American cities are finding themselves

in a position where they can provide such care without involving themselves in great initial expense. General hospitals with their out-patient departments and their staff of trained social workers are ordinarily well adapted for this type of service. There is also the possibility of utilizing vacant beds or even whole wings of tuberculosis sanatoria now more or less unoccupied. Actual experience has shown in several well-managed tuberculosis hospitals that the type of care and equipment necessary for the conduct of tuberculosis sanatoria are adapted also for the care of heart patients. There is nothing inherently difficult or dangerous in the undertaking, and it should be entirely possible as the tuberculosis death rate declines to shift the facilities of organized health agencies, both public and private, to the care of incipient and moderately advanced cases of heart disease.

The life insurance companies occupy a particularly favorable position in the campaign we are sketching. The large number of examinations made annually by insurance medical examiners discover many new cases. A number of companies offer free annual examinations to their policyholders and these, too, result in bringing many cases to light. The value of this service can hardly be overestimated. A few of the larger and more powerful companies, because they pay out millions of dollars in death claims each year on account of heart disease, are especially active in spreading hygienic information broadcast among their policyholders and the general public. But what is the

attitude of the companies toward those who on examination are found to have a heart defect? Do they insure such persons and, if they do, what has been their experience? On the whole, the companies have been rather conservative. Lacking information as to the gravity of most heart defects, they have permitted themselves to insure limited numbers and those only who had the least dangerous lesions. The experience has been concentrated in a few companies. Taken all together, the mortality rate has been found to be about two and a half times as high as that which prevails among normal people accepted for standard insurance. The cases have been almost altogether limited to those having the hypertensive or arteriosclerotic type of the disease, cases with a slight enlargement, and in which the mitral murmur is not pronounced. These are the cases which Dr. Mackenzie, the great English heart specialist, looked upon very favorably. He felt that the insurance companies could take a great many such people without loss, but experience has shown that he was not correct. Only the least impaired cases of organic heart disease are insurable; the rest require premiums so high as to put insurance out of reach of most persons. As information and experience increase, protection will undoubtedly be offered to larger numbers.

IV

What shall we say as to the future of our problem? The prognosis is neither very clear nor very

encouraging. There is good reason to believe that the extension of the program of prevention along the lines we have outlined will save many lives and prevent much suffering among young people especially. With more effort it should be possible to keep larger numbers of persons with impaired hearts active for longer periods with greater comfort for themselves and less financial strain on their families. There are many people who suffer from chronic heart affections and who break down at or before age sixty. Nothing could be more desirable than to postpone their premature collapse. The possibilities for such service are good. There is, however, much disappointment in store for those in the heart movement who are sanguine of quick results. This enemy of mankind will not be easily vanquished. Wherever we suffer from the results of man's habits, relief will come slowly. There will always remain a heavy tax payable by way of heart disease. The future will probably show more heart deaths than less. The achievements of preventive medicine will work in that direction, for they will bring many people over into the older ages when the heart mechanism finally breaks down. If only we could be sure that a death from heart disease was synonymous with a long life and no serious interference with work! That is really the aim of the heart movement. But to accomplish this end much time will pass and much more knowledge will be needed on the causes of heart disease, on how to prevent it and, fail-

ing prevention, how to take care of the afflicted over longer periods of time. A high type of statesmanship will be required to put this knowledge to work. The educator and the social worker will share with the physician in this new service.

CHAPTER V

THE PROBLEM OF TUBERCULOSIS[1]

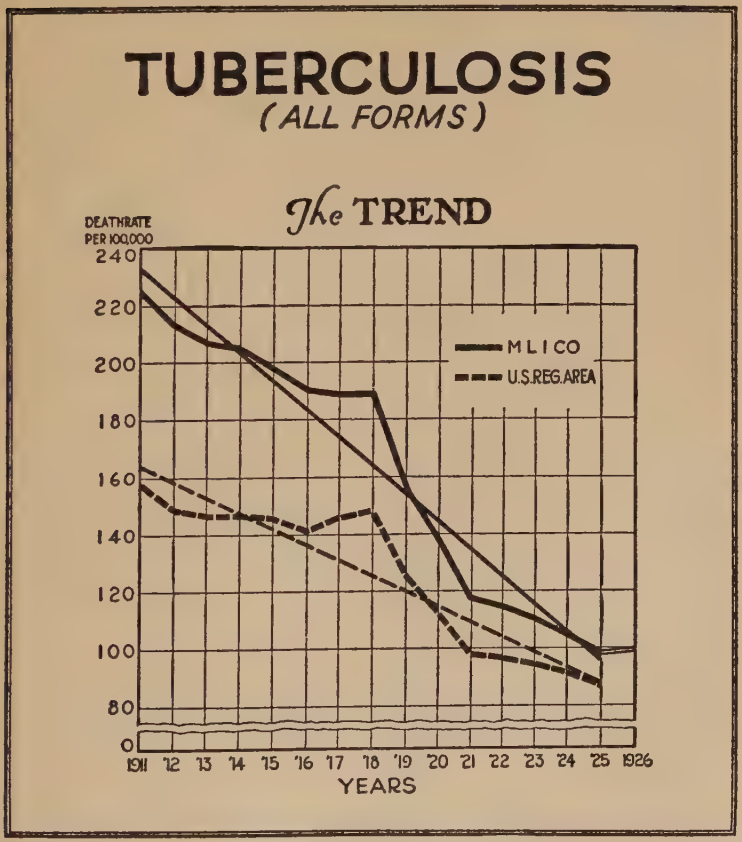
THE decline in the tuberculosis death rate during the last twenty-five years is, in my judgment, the most outstanding fact in the tuberculosis problem. This decline has been large in amount and continuous in character. There has been no backsliding; there has never been any doubt as to the tendency of the tuberculosis death rate during this period. In 1900 (and that, by the way, was the first year for reliable statistics on tuberculosis for any large part of the United States) the death rate was 195.2 per 100,000 of population. In 1910 the rate in the same geographical area, namely, the Original Registration States and the District of Columbia, had dropped to 164.7, or 15.6 per cent, in the ten-year period. In 1920, the rate in the same states was 112.0. This is 42.6 per cent less than the figure for 1900. In the second decade—that is, from 1910 to 1920—the rate fell 32 per cent, or a little more than twice as fast as in the first decade. In 1925 the rate went down to the low figure of 82.9 per 100,000. In 1926 the figure rose to 84.5, which still is less than one-half the figure for 1900.

[1] An address presented to the National Tuberculosis Association, Santa Barbara, California, June, 1923.

THE DECLINE IN TUBERCULOSIS

Let me leave with you another picture, and that is of a group of some eighteen million people insured in the Industrial Department of the Metropolitan Life

CHART IV



Insurance Company. Since 1911 accurate records of their mortality have been kept. Every death is recorded and the number of persons insured is also

known. There is little room for error in the calculations. Now, in the year 1911 the rate of mortality for tuberculosis was 224.6 per 100,000 insured persons. These are working-people, mind you—men, women and children—constituted, as to age and sex, about the same as is the general population. By 1925 the tuberculosis rate among these people had dropped to 98.2, and in 1926, it rose slightly to 99.2. The decline between 1911 and 1926 was 55.8 per cent. The improvement was resumed in the year 1927 and in the first nine months we have recorded a decline of 8.7 per cent among white policyholders and of 1.7 per cent among colored from the corresponding figures for 1926. Chart IV on page 85 shows what has happened in this group of insured wage-earners.

I have shown you that with reference to the general population, the death rate from all forms of tuberculosis has declined more than 50 per cent in twenty-six years, and that in a large group of insured persons the same amount of decline has occurred in a little over fifteen years. The improvement in the figures means that 130,000 fewer persons are dying each year in the United States from tuberculosis than would have died if the tuberculosis death rate of 1900 were still prevailing.

II

My purpose, however, is to discuss the causes underlying the decline. As every one knows, there is

much difference of opinion as to what has caused the decline in tuberculosis mortality. The first step in a scientific discussion is to set for oneself a theory or a probable explanation on the basis of such evidence as is available and then to see how that theory squares with all the facts of the case. In connection with the decline of the tuberculosis death rate there are two outstanding explanations. I shall consider these two opposing views and attempt to show whether or not they square with the facts.

The first is espoused by most of the workers in the field of public-health and ascribes the fall in the tuberculosis death rate during this period of twenty-seven years and for a long period before, to the great improvement in the general well-being of the population. The improvement is due, they say, primarily to activities within human control. Those who hold this view say that the great mass of the population is pretty generally exposed to infection, and that those who break down and become active cases of tuberculosis, and later die, are those who have not had the resistance to localize and control the foci of infection within them. With that thought in mind, the proponents of this view early developed a broad campaign of general education of the population. A knowledge of personal hygiene was widely disseminated in order that individuals might learn how to strengthen their resistance against the development of active symptoms of the disease. This was the keynote of the general cam-

paign against tuberculosis as outlined by this Association when it was founded in 1904.

The campaign against tuberculosis was accordingly directed toward finding the large numbers of individuals who were breaking down with the disease, to strengthen their resistance, and to make them well again if possible, and, second, to prevent their infecting others. That meant, of course, the establishment of such institutions as the tuberculosis clinic, the training of many physicians in the technique of diagnosis, the building of sanatoria for the care of early cases and of other institutions for the more advanced cases, and the segregation of those individuals, who having broken down, might become a source of danger to others. I need not enumerate all the activities and agencies which have grown out of this conception of the origin and control of tuberculosis. It is sufficient to say that all over the world a definite technique for the control of tuberculosis has been developed on the basis of this theory. This probably has received its best and most acceptable expression in the writings and practical works of Dr. Philip of Edinburgh.

The underlying principle of his campaign and of his followers has been that tuberculosis was subject to human control. The disease developed because of infection and the weakened defenses of the individual. This might be due either to undesirable conditions of the organic and physical environment or to weakened personal constitution, or to both. This school did not lose sight of the importance of the constitutional fac-

tor. It realized that there are differences in the capacity of individuals to resist the development of infection and breakdown. But it saw that, with respect to the constitutional factor, man could do very little except to make the most of what constitutional equipment he had. The emphasis of this group has, therefore, been placed where it could be effective, namely, in the constant improvement of the status of human beings. The campaign against tuberculosis has attempted to make the lot of men and women happier and easier, to improve their personal hygiene, to remove possibilities of gross infection, and to give many individuals a fighting chance to throw off disease which they would not otherwise have in their usual methods of life. Acting on this theory, a flourishing and world-wide activity has developed and those associated with it have very naturally claimed that a measure of the decline which has appeared in this period may be credited to their and allied efforts.

The second explanation or theory minimizes the importance of the environmental factors in the control of tuberculosis. It places great emphasis on the fact that the decline in tuberculosis antedates by many years the development of the tuberculosis campaign as at present understood, going back, in fact, to the early decades of the nineteenth century. Those who support this second view emphasize the all importance of the genetic—that is, the constitutional factors. They grant the universality of infection, but they insist that those who break down are a special group whose

constitutions, in advance, have doomed them to tuberculous disease. They insist, moreover, that the tendency to have tuberculosis is inherited like other physical characteristics, and that observation will discover a distinctively tuberculous stock or phthisical constitution, quite irrespective of the environment, mode of life, or any effort that man might make either to avoid infection or to build up individual resistance.

A corollary of this explanation has been that hardly any of the decline to which we have called attention could have resulted from the tuberculosis campaign. It is not in the nature of the disease, this group says, to be amenable to the kind of treatment that has been given to environmental factors. There is, as you know, a school of biological writers who for many years have labored to show that the tuberculosis campaign as it has crystallized in official and voluntary agencies, was doomed to failure. In its extreme form as stated by Dr. Given and quoted by Professor Pearl of Johns Hopkins University, the view is expressed that "there is no evidence that anything that man has done has affected in either one way or the other the decline in the mortality of tuberculosis which has been continuous for nearly three-quarters of a century." In fact, it has been urged that such effort as has been made is likely to have done more harm than good by encouraging the reproduction of phthisical stocks and thus thwarting the influence of natural selection. The decline in tuberculosis, on this view, is ascribed to the influence of the disease itself as a selective agency in

eliminating less fit stocks and thus preventing the reproduction of such individuals. Possibly, it is best to quote Professor Pearson's own statement.[1]

"Has or has not the selection due to many years of heavy phthisis mortality left us with a more immune and resistant population? If it has—and that I believe will be found to be the ultimate explanation of the fall, especially the *retarded* fall in the phthisis death rate—then infection is not the only factor worth investigating. There is the question of hereditary immunity. It may be a bitter pill for mankind to swallow, when we suggest that natural selection may have done more for racial health in this matter than medical science, but it may have its compensations from the economic standpoint. Above all, it may suggest that Evolution helps man better than he at present knows how to help himself, and that possibly he would learn to help himself better if he studied her processes of racial selection a little more closely."

III

These then are the two views which I hope, I have stated clearly and without bias. The first emphasizes the importance of the environmental factors in the causation of tuberculosis and credits the improvement in the death rate to those human activities which have centered around the amelioration of the environment of the great mass of people. The second emphasizes the importance of stock and ascribes the decline to secular changes in the germ plasm of nations and of races which follow from the full interplay of natural forces, rather than from the conscious inter-

[1] Karl Pearson: *The Fight Against Tuberculosis and the Death Rate from Phthisis: Questions of the Day and the Fray*—Number 4: Department of Applied Statistics, University College, London, 1911, pp. 34-35.

ference of man with nature. After all, these are only attempts at an explanation. They have no assured validity unless they square with the body of facts. I will, therefore, rehearse some of the commoner characteristics of the disease, tuberculosis, and shall try to see how often each of the two views appears to be consistent with or in opposition to the facts. The factual data are so numerous and often so clear cut that we should have little or no difficulty in determining which of the hypotheses we have outlined has the better of the argument.

Geographical Variation in the Tuberculosis Death Rate.—The amount of fatal tuberculosis varies greatly in different parts of the United States. Tuberculosis is preëminently an urban disease, although it prevails in rural sections of the country to a less degree. In 1917, the urban tuberculosis death rate was 159.2 per 100,000 population and the rural, 130.3. In 1925, twenty-five of the forty Registration States had higher urban than rural rates and the death rate in the cities as a whole was 86.8 per 100,000 as compared with a rural death rate of 84.1. Apparently in recent years, the contrast between urban and rural communities has become considerably less marked. At the same time, it must be remembered that many of the sanatoria and hospitals for the tuberculous are located in rural areas and these sections are charged with all the deaths that occur there, although many of the patients contracted the disease in the city. If the necessary corrections were made for the original residence of patients, the differ-

ence between the two rates would favor the country far more.

Then, too, most people are familiar with the fact that the death rate for tuberculosis is very much lower in some states than in others. The lowest rate in 1925 is found in Utah, namely, 29.6 per 100,000. Wyoming has a rate of 31.0; Nebraska, a rate of 32.5. Beginning with these minimum rates, the figures increase gradually until we get to New York with a rate of 92.1, Delaware with a rate of 100.4 and Tennessee with a rate of 137.6. There are even higher rates, as, for example, for California and Colorado, but we realize that these high rates are due in large measure to the migration of tuberculous persons to those areas. It is, therefore, unfair to use the last figures in interstate comparisons. But, excluding these states, the figures, varying from 30 in Utah to 138 in Tennessee, present a fair range of variation in the states of the country (see Table 1, page 94).

Finally, we may note the diverse rates in the large cities of the country. There is first Grand Rapids with a rate of 42.2 in 1925; Des Moines, 42.4; and Spokane, 45.8. Further down the list, we find such cities as New York with a rate of 94.7; Philadelphia, 101.3; and Baltimore, 120.5. At the end of the table, we find cities like New Orleans, 183.9; Denver, 188.3; and San Antonio, with a rate above 200 per 100,000. But, the high rates in the last two cities reflect the concentration of the migrant tuberculous within their limits (Table 2, pages 96-97).

TABLE 1

Death Rates per 100,000 Population in United States Registration States Tuberculosis—All Forms

1925

Area and States	Death rate	Area and States	Death rate
U. S. Reg. Area	86.6		
Orig. Reg. States of 1900	82.9		
States ranked according to death rate in 1925:		South Carolina	93.8
		White	42.6
		Colored	146.0
Utah	29.6	North Carolina	99.4
Wyoming	31.0	White	68.4
Nebraska	32.5	Colored	173.3
Idaho	33.9	Alabama	100.1
Iowa	42.1	White	58.7
Kansas	44.8	Colored	172.5
North Dakota	49.6	Delaware	100.4
Montana	58.9	District of Columbia	110.5
Minnesota	60.2	White	54.8
Wisconsin	61.6	Colored	286.6
Maine	63.2	Mississippi	107.7
Oregon	64.9	White	49.3
New Hampshire	65.7	Colored	160.9
Michigan	66.5	Virginia	109.2
Vermont	71.2	White	73.2
Connecticut	73.8	Colored	198.7
Ohio	74.5	Louisiana	111.1
West Virginia	76.7	White	64.8
Pennsylvania	77.0	Colored	190.0
Illinois	78.1	Kentucky	119.3
Washington	79.1	White	105.2
Florida	79.9	Colored	263.7
White	50.6	Maryland	120.8
Colored	141.9	White	87.0
New Jersey	80.3	Colored	293.7
Indiana	82.2	Tennessee	137.6
Rhode Island	82.9	White	104.9
Massachusetts	83.0	Colored	284.9
Missouri	87.2	California	142.0
New York	92.1	Colorado	152.4

Here, then, are our first facts. Let us try to square them with the two explanations. The environmentalists, although I use that term advisedly, approach this phenomenon of extreme variation in the tuberculosis death rate without hesitation. They are familiar with it and have, in fact, based much of their assurance on it. Those who live in the country—the rural population—they say, might be expected to have a lower rate. They are engaged in more healthful occupations; they live in less congested places; they live more normal, happier lives; they enjoy a larger and better supply of food and lead altogether a more wholesome existence. Those who live in cities, on the other hand, are in more congested quarters and, therefore, more subject to infection; they are often engaged in industries which are more distinctly hazardous to general health; they are, on the whole, poorer and less well supplied with good food and fresh air. Life is harder and more hazardous in the cities and there are more chances for the natural resistance of the individual to break down.

The environmentalists explain the differences in the various states and cities in much the same way. They stress the fact that often those places which have the lowest rates excel in their efforts to make life better. Some are the states and cities where the people are most intelligent and prosperous, least crowded and driven in their efforts to make a living. Often they are the centers which have deliberately made the greatest effort to meet their tuberculosis situation by pro-

TABLE 2

Death Rates per 100,000 Population. United States Registration Cities in 1925
Tuberculosis—All Forms

City	Death rate	City	Death rate
Grand Rapids	42.2	Cleveland	87.7
Des Moines	42.4	Norfolk	89.4
Spokane	45.8	White	37.1
New Haven	47.5	Colored	186.7
Syracuse	48.9	Detroit	90.0
Minneapolis	49.2	Trenton	90.9
Springfield, Mass.	51.3	Columbus	91.4
Scranton	54.2	Buffalo	91.8
Salt Lake City	54.2	Toledo	93.1
Camden	57.4	Paterson	94.4
Rochester	59.4	New York	94.7
Hartford	59.4	Bronx Borough	77.1
Milwaukee	61.3	Brooklyn Borough	73.0
Providence	61.6	Manhattan Borough	134.2
Oakland	62.5	Queens Borough	70.5
Newark	64.5	Richmond Borough	118.6
Omaha	68.4	Fall River	95.3
Reading	69.9	Indianapolis	96.9
Dallas	70.7	White	74.9
White	50.7	Colored	262.4
Colored	199.2	New Bedford	97.1
Youngstown	71.3	Boston	100.7
Wilmington, Del.	73.8	Philadelphia	101.3
Worcester	74.9	Richmond	101.6
Fort Worth	75.5	White	58.7
White	57.4	Colored	204.7
Colored	205.3	Kansas City, Mo.	104.3
Yonkers	76.6	Atlanta	107.9
St. Louis	77.3	White	56.2
Cambridge	79.4	Colored	228.4
Jersey City	80.0	Louisville	108.5
Dayton	82.2	White	89.5
St. Paul	82.5	Colored	214.7
Chicago	83.0	Washington, D. C.	110.5
Lowell	85.2	White	54.8
Pittsburgh	86.1	Colored	286.6

TABLE 2 (*Continued*)

City	Death rate	City	Death rate
San Francisco	115.5	Nashville	140.5
Cincinnati	117.1	White	81.4
Albany	117.9	Colored	288.0
Baltimore	120.5	Memphis	159.4
White	82.6	White	67.2
Colored	339.9	Colored	322.3
Birmingham	139.9	New Orleans	183.9
White	51.2	White	122.7
Colored	276.5	Colored	358.5
Kansas City, Kan.	140.4	Denver	188.3
White	83.7	San Antonio	230.3
Colored	422.7		

viding adequate facilities for the care of the sick and for the education and protection of the well. The geographical differences in the death rates reflect for the most part, the environmentalists say, the differences in the arrangements which the communities have made to make life in them happier and better.

The geneticists or the constitutionalists, on the other hand, have not made much of the facts of geographic variation, and it is difficult to summarize the views that they hold in explanation of these facts. Obviously, it would be necessary for them to assume that the differences in the death rates represent differences in the innate stocks with various degrees of immunity or resistance to tuberculosis in the several parts of the country. They are compelled to posit a hierarchy of constitutional vigors corresponding to the low rates

and the high rates. They must assume that the population in the rural areas is constitutionally better selected than that in the cities; that the population living in Nebraska, for example, is a fitter population than that living in Delaware or in New York; that the people living in Grand Rapids are innately more vigorous than those living in Indianapolis. Without any desire to prejudge the case from this single line of evidence, it must be clear, I think, that on the score of variation of the death rate, the environmentalists have very much the better of the argument on the first count. Their assumptions are consistent with everyday observations of the differences in the modes of life and in the general level of well-being in the various parts of the country. Their explanation does not add difficulties which in their turn need expounding. But, the explanation of the second group has simply substituted one difficulty for another. There is no warrant in fact for any such degree of difference in our races and populations as their theory would demand. The people of the various states and cities are, with a few outstanding exceptions, altogether too much alike in their inherited qualities and their race histories to explain the enormous differences we have described.

Sex and Age Variations.—But, of course, geographical variation is only one and the first test. Another fact about the tuberculosis death rate which is almost universal, is the marked difference in the death rate in the two sexes. Tuberculosis mortality is much

higher among males than among females. Among the policyholders of the Metropolitan (and similar conditions are found in the general population of the United States) the death rate among white males during the period 1911-20 was 36 per cent higher than among white females. That is for all ages combined. Among the colored, the excess of the male over female mortality in the same period was 8 per cent. In 1926 the white male rate was 15.6 per cent higher than the female rate; the colored female rate, however, was 0.6 per cent higher than the male rate. But let us analyze these figures a little with reference to age. In Chart V, page 101, the solid line shows the death rate from tuberculosis among males in the various age periods of life, beginning with early childhood, increasing by five-year periods to old age. The broken line illustrates the facts for females. The aggregate—that is, taking the whole of life together—shows, as I have said, an excess of tuberculosis deaths among white males, but a slight decrease among colored males, in 1926. But if we keep in mind the age element, the picture is somewhat different. In the first two age periods of life, up to the age of ten, the rates are so nearly the same that there is no point in making a distinction between the sexes. Beginning with age ten, the rate for females is higher than for males, and that continues for the next fifteen years of life up to age twenty-five for both the white and the colored groups. The excess of female over male mortality is considerable. Beyond age thirty the rate for females

drops rapidly and continues among white persons throughout the rest of life below that of males. The white male rate reaches its maximum at about age fifty-two years and is then 214.1 per 100,000; the white female rate is highest at about twenty-six, when it is 138.3 per 100,000. The curves for the two sexes are clearly very different. The excess rate of males in general is limited to the ages beyond thirty, while the females show an excess at the younger ages.

How do the two explanations square with this fact? The environmentalists would say that the boys and girls in our country are pretty much the same as to exposure and as to resistance. The higher rate for females at the ages of adolescence and early adult life they would explain on the assumption that at this period developmental changes in the organism involve greater hazards than among males. The intense internal changes that accompany puberty and the mechanism of development to maturity in the female are sufficient, they say, to explain their lower resistance. The hazard of child-bearing must also be considered. Pregnancy is often fatal among those who have incipient tuberculosis, and many breakdowns are traceable to the first childbirth. Moreover, in the last twenty years a large and ever-increasing number of young women and girls have gone into gainful occupations, remaining at work for greater or less periods and sharing with men the hazards of work, though possibly less well equipped for such strains.

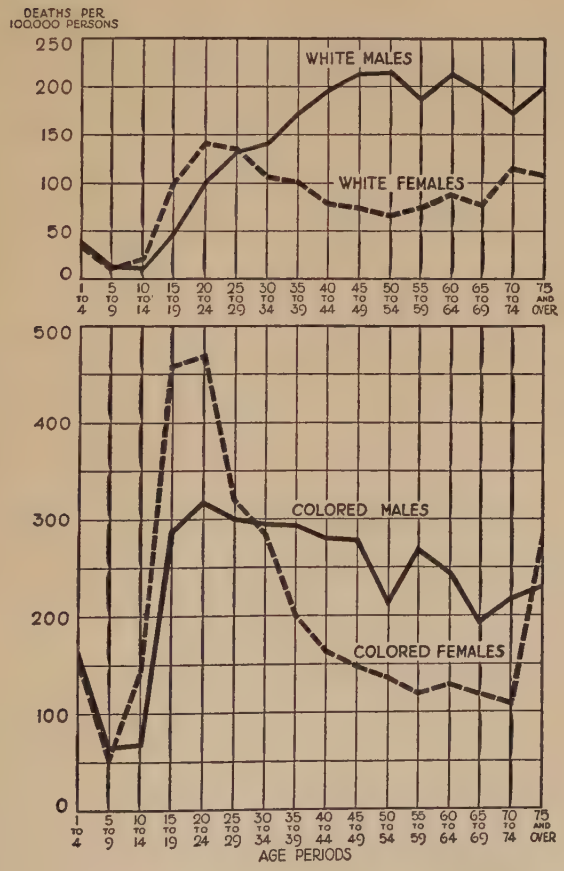
In any case, the change in the sex ratio of tuber-

CHART V

TUBERCULOSIS DEATHRATES

By Sex, Color and Age

Metropolitan Life Insurance Co., Industrial Dept., 1926



culosis mortality comes at about the twenty-fifth year of life, and thereafter females enjoy decided advantages. Fewer of them are engaged in industry with the hardships of factory routine; they lead a more regular and sheltered life; they indulge in fewer excesses, have better habits, and take better care of themselves. For these reasons, those who hold the first view would expect to find the facts with reference to the death rate in the two sexes very much as they actually are.

On the other hand, those who sponsor the theory of the constitutional factor in tuberculosis causation must explain the changing relationships of the death rates in the two sexes with advancing age. They must assume a difference by inheritance, or by selection, in favor of males at the younger ages and in favor of females at the older ages. There is no evidence for such differential hereditary endowment among brothers and sisters. I should say, however, that they have at no time, to my knowledge, addressed themselves to this problem or attempted to explain the phenomenon.

Racial Variability in the Tuberculosis Death Rate. —The third outstanding fact in a description of tuberculosis is the marked difference in the rate of mortality which prevails in the various nativity groups composing the population of the country. In a previous study I have shown how different is the mortality from this disease in the six or seven principal stocks that constitute the population of the states of New York and

Pennsylvania.[1] The figures are so clear-cut and so much the same in the two states studied that I would expect to find a similar situation to exist generally throughout the country. Table 3, page 104, shows the facts with reference to the mortality from tuberculosis for males and for females, respectively.

In general, we found that the death rate was lowest among those born in Russia, who, in these two states are for the most part Jews. This interesting fact has been observed again and again not only in the United States, but in other parts of the world where the mortality of Jews has been carefully studied in comparison with that of their neighbors. Tuberculosis does not appear to be so fatal among them as among other races. The disease when it appears is more often of long duration. The rates are also very low among the Italians. In fact, at some age periods, the rates were actually lower among those born in Italy than among those of Russian birth. The Austro-Hungarians, who in these two states are also often of Jewish extraction, show very low rates. These three nativity groups at many of the age periods show lower tuberculosis rates than those for the native whites. The native whites, on the whole, present an intermediate position between these three nativity groups and those born in Germany, Great Britain, and Ireland. The highest rates are found among both males and females born in Ireland. This is more especially true in New

[1] *The Mortality of Race Stocks in Pennsylvania and New York:* Louis I. Dublin and Gladden W. Baker. Quarterly Publication of the American Statistical Association, March, 1920.

TABLE 3

Comparative Mortality from Pulmonary Tuberculosis of Different Race Stocks in New York and Pennsylvania, 1910

Sex and age period	Death rate per 100,000 living at same ages of persons born in													
	Austria-Hungary		Russia		Italy		Germany		England, Scotland, and Wales		Ireland		United States (whites only)	
	Pennsylvania	New York	Pennsylvania	New York	Pennsylvania	New York	Pennsylvania	New York	Pennsylvania	New York	Pennsylvania	New York	Pennsylvania	New York
Males:														
All ages	118.0	166.0	107.4	114.7	81.5	112.1	194.9	267.4	150.2	215.2	342.8	589.3	105.1	170.9
Under 10	13.8	16.7	15.4	23.5	19.9	8.3	147.9	.....	.....	23.4	.....	.....	23.3	23.4
10–14	35.5	14.1	.....	11.7	23.0	15.1	.....	52.8	.....	36.9	.....	.....	11.2	10.2
15–19	55.4	102.4	69.6	60.5	43.4	106.8	.....	90.8	120.3	128.7	428.0	312.3	61.1	101.5
20–24	106.5	93.1	99.6	96.4	86.5	140.4	211.3	45.9	59.3	71.5	127.7	327.3	147.6	216.3
25–44	110.6	177.2	105.9	117.1	71.2	102.0	198.2	252.5	151.5	240.5	375.8	662.9	185.2	352.0
45–64	264.2	302.5	225.1	246.4	154.3	172.9	230.3	350.0	165.3	268.9	408.8	682.1	174.1	262.1
65–84	242.7	247.9	148.7	182.4	631.8	208.5	140.6	211.3	233.5	210.3	206.1	329.3	189.3	161.4
85 and over	.....	.....	.....	.....	.....	.....	180.2	210.7	.....	.....	.....	357.6	60.0	69.3
Females:														
All ages	130.2	102.6	91.7	74.6	102.2	160.1	90.4	115.3	133.2	123.3	201.2	276.1	98.8	109.6
Under 10	27.4	.....	31.3	.....	42.0	34.0	.....	51.7	41.6	23.2	.....	.....	19.1	20.6
10–14	17.3	13.7	.....	5.7	.....	89.1	.....	.....	.....	.....	.....	138.1	19.3	27.1
15–19	74.2	49.6	70.9	28.0	102.0	220.6	39.1	76.9	84.4	64.0	63.6	185.6	91.5	111.5
20–24	141.2	87.9	92.6	88.7	153.6	247.7	128.0	158.2	80.4	121.5	121.6	167.7	162.3	186.3
25–44	152.7	137.2	108.0	104.7	114.8	159.3	106.2	125.1	166.9	165.4	235.3	353.4	172.8	193.3
45–64	162.3	122.9	124.6	80.8	77.7	123.3	85.4	109.7	112.2	92.1	220 7	250.1	108.9	111.1
65–84	215.7	142.1	178.7	94.3	217.3	55.4	72.9	106.3	153.7	139.3	140.9	192.1	178.7	137.9
85 and over	.....	.....	.....	.....	.....	793.7	156.7	80.3	314.5	164.5	148.6	.....	100.9	32.6

York than in Pennsylvania, but in both states, the conditions in this race are notoriously bad. In fact, at some of the age periods, the Irish males have as high tuberculosis death rates as have been found to occur among colored males.

It is difficult for anyone confronted with these facts to escape the conclusion that an inherited racial immunity is a factor in the development of tuberculosis. Certainly, everyone must recognize that, with reference to such races as the Jews and the Italians, there is a constitutional resistance to tuberculosis and that among the Irish, there is a peculiar susceptibility to heavy mortality. The differences in economic status and modes of life are probably not sufficient to explain the extreme divergencies we have observed. This is clearly a count in favor of the second or genetic explanation for the development and decline of tuberculosis and those who favor this view have not been slow to emphasize this important fact in developing their argument. On the other hand, there are certain allied facts to be considered which throw additional light on this interesting phenomenon. The rates among the Jews and the Italians are not everywhere uniformly low, but show considerable variation from place to place, reflecting, in fact, the better and worse conditions among which the Jews and Italians of this country live. Thus Drolet, of the New York Tuberculosis Association, has shown that the Jews living in the various parts of New York City have markedly different tuberculosis death rates, varying from 83 per 100,000 in the old

and congested downtown Gouverneur District to 52 per 100,000 in the newer and more open Bronx-Tremont District. Although the people are racially the same, the conditions of life are much more favorable in the newer sections of the city. Environment plays its part to color the racial picture. So, too, the high rates of the New York City Irish are markedly higher than the figures for these people in their native country, in fact often twice as high. Here, again, we see the secondary effects of environment. The Irish immigrant is a crowded city dweller suffering from all the hardships of congested and impoverished city life. In the old country, they were, for the most part, rural dwellers. And, so, admitting the importance of the constitutional factor in the racial picture of tuberculosis, we must not lose sight of the equally great bearing of the environment within which the individual races live. While one race may enjoy an advantage over another with respect to tuberculosis, it is still capable of having higher and lower rates consistent with various modes and stations of life. In other words, in spite of the racial limitation, it is entirely possible for any people to modify a natural tendency to a high or a low rate through the development or neglect of safeguards which hygienic living apparently makes possible.

Variations in Economic Levels.—Another important fact in our discussion is the difference in the tuberculosis death rate in the various economic strata of the population. I have at my disposal a series of death

rates for tuberculosis in three main groups of the population; first, for Industrial policyholders of the Metropolitan Life Insurance Company; second, for those who are insured in the so-called Intermediate Branch of this Company; and third, for those who are insured in the Ordinary Department. These three groups are sharply differentiated economically. The death rates are as follows: Let us take the age period twenty-five to thirty-four as an example. Among white males in the Industrial Department the rate in 1925 was 135.6; in the Intermediate Department 104.7, and in the Ordinary Department, 59.1 per 100,000. The other age periods show similar relations. The highest rates are found in the Industrial group with but two exceptions, at ages fifteen to nineteen and twenty to twenty-four years. The intermediate rates are found in the Intermediate group and the lowest rates in the Ordinary group. The economic status influences, as we see, the mortality from tuberculosis. As we go from lower to higher levels of economic well-being, the rates go down uniformly. There is, however, this striking and instructive exception, namely, that economic status makes little difference in the ages of childhood and adolescence. The children of the industrial population —*i.e.*, of the working-people—have almost as low rates for tuberculosis as exist in the general population. After age fifteen, the two sets of figures diverge, and thereafter the rates are lower for the general population than for the industrial. The difference becomes greater with advancing age (see Table 4, page 108).

TABLE 4

Mortality Rates from Tuberculosis—All Forms—per 100,000 Exposed at Specified Age Periods. Males in Several Departments of Metropolitan Life Insurance Company and in U. S. Registration States, 1925

Age Period	Metropolitan Life Insurance Company			United States (Reg. States of 1920) White males
	Industrial Department White males	Intermediate Branch Total males	Ordinary Department Total males	
All ages—one and over.....	84.3			78.7 *
All Ages—15 to 74.	136.6	108.0	61.5	104.4
1 to 4.....	29.1	....	....	26.6
5 to 9.....	9.5	....	....	8.7
10 to 14.....	11.4	....	....	10.1
15 to 19.....	53.7	61.3	33.5	39.5
20 to 24.....	103.0	119.0	71.4	81.2
25 to 34.....	135.6	104.7	59.1	98.4
35 to 44.....	187.1	103.1	63.7	117.7
45 to 54.....	204.0	130.9	64.4	124.5
55 to 64.....	181.8	129.8	60.4	135.4
65 to 74.....	179.9	153.6	55.7	165.8

* Ages one to 74

How shall this set of facts be explained? The environmentalists rest their case on the hardships of the life of the poor as we have already intimated; the constitutionalists on the superior endowments and vigor of the selected or "fit" groups who make up the well-to-do and richer classes of the community as distinguished from the poor. But how about the children? The figures would indicate, say the health workers, that the youngsters of the industrial classes are very well

endowed, indeed, if their low rates are an indication of their power of resistance. Is not this consistent also with everyday observation? Does not this fact indicate, they say, what one would suspect from other sources—that the working classes do not lack natural resistance? They do harder work, over longer hours and show in every way that innately their bodily vigor is no less developed than that of their better-off neighbors. But, constitutions are apparently not sufficiently ironclad to withstand without injury for long periods the wear and tear of modern industry. However good the initial endowment, long hours of toil in confined places often poorly ventilated, and only too often laden with dusts and poisons, the strain of attention to fast moving machinery, the effects of heat and the exhaustion of muscular energy, all finally tell. To these must probably be added the effects of frequent improper and inadequate diet, sub-standard housing, indifferent medical service and lack of opportunity for rest and recreation which are associated with the life of the poor. It is for this reason, as the environmentalists point out, that the industrial classes show higher rates and they do not begin to show them until the effects of their constant environment have begun to tell.

Occupation in Relation to Tuberculosis.—The incidence of tuberculosis in various occupations also throws light on the nature of the disease, on how it may be caused and how it may be controlled. I have already pointed out that those who are engaged in in-

TABLE 5

Comparative Mortality from Phthisis among Males, Ages Twenty-five to Sixty-five. Selected Occupations, Compared with Farmers. England and Wales, 1910, 1911, 1912 Combined

Occupation	Per cent death rate in specified occupation of phthisis death rate among farmers
Farmers, graziers, farmers' sons, etc.	100.0
Railway engine-drivers, stokers, cleaners	100.0
Motor-car, motor-van drivers	105.3
Builders	121.1
Agricultural laborers, farm servants	124.6
Brick, plain tile, terra-cotta makers	128.1
Iron-miners, quarriers	128.1
Engine-drivers, stokers, firemen (Not Ry., Marine, agr., or elec. supply)	133.3
Coal-miners	133.3
Shipbuilding	166.7
All shopkeepers	205.3
Cotton manufacture	210.5
Wool, worsted manufacture	217.5
Domestic coachmen, grooms	217.5
Bricklayers	224.6
Carpenters, joiners	224.6
Engine-, machine-, boiler-makers, fitters, millwrights	231.6
Copper workers, coppersmiths	256.1
Painters, decorators	268.4
Clerks	270.2
Brewers	317.5
Furriers, skinners	319.3
Hatters	321.1
Glass manufacture	322.8
Tailors	328.1
Watchmakers, clockmakers, jewelers	328.1
Hotel-keepers, publicans, spirit, wine, beer dealers	347.4
Printers	368.4
Shoemakers	389.5

TABLE 5 (*Continued*)

Occupation	Per cent death rate in specified occupation of phthisis death rate among farmers
Brass, bronze workers, founders, finishers, workers	408.8
Stone-getters, dressers, masons	415.8
Seamen, etc., merchant service	456.1
Group of laborers	461.4
Potters-earthenware, etc., manufacture	494.7
Lead-miners	587.7
Stone-getters, dressers, masons (counties producing sandstone)	728.1
Costermongers, hawkers	738.6
Barmen	761.4
File-makers	761.4
Cutlers, scissors-makers	817.5
Tin-miners	1200.0

dustrial processes show uniformly higher mortality rates than the general population of comparable age periods. This fact is strikingly brought out in the much lower death rates of females than of males during the working ages of life. But even within the male sex there is much variation among the several industries and occupations in which people are engaged. This fact has a long time received the attention of students of the disease, and an extensive and instructive literature has developed. The results of investigations have been so consistent and clear cut that occupations have actually been graded in a series as to whether they are conducive to the development of

tuberculosis or not. On the whole, there is general agreement in the data for the several parts of the world.

Leaving out the professional group in order to avoid the complication of better economic status and other factors which might condition the result, and limiting ourselves to the fairly homogeneous group of wage-earners and farmers, we find that the best conditions occur among those engaged in agricultural pursuits. The tuberculosis death rate of this class of workers we may designate as our unit of measure. The other occupations may then be graded on the basis of the percentage which their tuberculosis death rate bears to that of agricultural workers. The table of occupations (pages 110-111) is selected from the report of the Registrar General for England and Wales for the years 1910, 1911, and 1912.

This table discloses a number of surprising relationships. Coal-miners, who are engaged in fatiguing work and are exposed to dust appear close to the best group. This phenomenon has for many years engaged the attention of tuberculosis investigators. The great mass of open-air workers on the railroads show extraordinarily favorable tuberculosis rates. In the complete list of the Registrar General, there are no less than twenty-six occupational classes which show a mortality from phthisis almost four times as great as farmers. Very high figures are shown for occupations exposed to hard metallic and mineral dust, such as, lead-miners, with almost six times the farmer rate;

file-makers, with over seven times as much; and cutlers and scissors-makers with over eight times. At the end of the scale are the tin-miners with a rate twelve times the farmer rate. But such non-industrial occupations as barmen and seamen compete with the high figures already quoted.

The general conclusion drawn by most students of the relation of tuberculosis to industry has been that the highest rates are found among those exposed to mineral and metallic dusts; next to these are the occupations exposed to the use of alcohol, and then those that are exposed to lead. Certain occupations with exposure to the hardships of weather and occupations with exposure to organic dusts also are generally found to have a high frequency. Investigation of the factors which enter into the lives of the various classes of industrial workers does not seem to indicate that high and low rates are always the direct influence of the occupation, but are often coupled with the mode of life and the home environment of the individual workers. Eliminating the very worst occupations, and limiting their observations to the great bulk of factory occupations which are neither dusty nor otherwise especially injurious, but, nevertheless, present high rates, Drs. Collis and Greenwood offer the following explanation: "The rôle of the factory is, by confinement in monotonously ventilated rooms and by causing general fatigue, to reduce the resistance of the operative to those sources of infection to which he is exposed in the natural course of life, to make him react more

sharply to home influences than does his wife or sister."

For us the important point is whether the evidence we have presented is more consistent with the one or the other of the two explanations as to the causation and the decline of tuberculosis which we are discussing. The theory of the geneticists would demand that those who are engaged in various occupations are selected somehow in accordance with their various grades of resistance and inherited ability to withstand tuberculosis. Some occupations undoubtedly attract weaker individuals. I doubt very much, however, whether such an explanation would apply to any considerable number of occupations we have listed. Obviously, many of the occupations with the highest rates call for workers with the greatest vigor. On the other hand, the effect of the industrial environment on the life of the worker is very clear cut, even if often marked by the influences of economic condition, grade of intelligence, and other elements which affect life. The enormously high tuberculosis death rate of tin-miners and of stone-cutters is very clearly the result of the injury done to the lung tissue by the material with which they work. This is an extreme picture, but it points to the explanation which underlies the conditions in other occupations where the hazards are not so extreme or clear cut, but where, just the same, the effect of the occupation makes itself felt. It makes little difference in the long run whether it be fatigue or monotonous employment, or the effect of vitiated atmosphere which breaks down the resistance of the in-

dividual and makes him an easier and earlier prey to the development of tubercular disease.

IV

Recent Changes in the Tuberculosis Death Rate.— Finally, we shall consider the changes in the tuberculosis death rate in recent years, both in this country and abroad, to see if in any way we may be able to throw light on the nature of the disease and to determine whether the facts are more or less consistent with one or the other of the two theories which attempt to explain its causation and the method of its control. As we have seen, the tuberculosis death rate in the general population of the United States has fallen more than 50 per cent in a twenty-six-year period. In the special but large group of insured lives, the same amount of reduction has been observed in a period of fifteen years. In more recent years, since 1918, declines of as much as 10 or more per cent per year have occurred. The decline, moreover, has not been uniform in all the groups of the population, but has favored males more than females, white lives more than colored lives, and certain definite age periods more particularly than others. We find, for example, among the insured lives where this phenomenon has been carefully studied, that white males showed a decline of 62.7 per cent in the fifteen-year period between 1911 and 1926, as contrasted with a decline of only 54.9 per cent in the same period for white females.

The chart on page 117 shows the above changes between 1911 and 1926 in sharp relief. With this evidence in mind, one would be tempted to deny that the type of age incidence in tuberculosis has any marked stability. Certainly there can be no ground for the conjecture of Dr. Brownlee that the contour of the curve for age indicates the existence of three distinct types of tuberculosis, namely, a type chiefly affecting youth, a second affecting persons in middle life and third, a type attacking persons in old age. The facts for the four classes of Industrial policyholders, as shown in Chart VI and which are perhaps accentuated examples of what has occurred in the general population, leave us convinced that tuberculosis is not a slowly changing condition with fairly fixed characteristics of sex, color and age incidence, but a more fluid phenomenon responding quickly and incisively to external modifications when these are properly chosen and well directed.

Of greatest interest is the fact that the maximum decline occurred among white males in the period between twenty and forty-five years of age, where the decline approximated 65 per cent. The greatest decline has occurred where the rates were originally highest and least where the rates were lowest. There is a close association between the amount of decline and the excess of the death rate in the earlier periods. Of equal importance is the fact that, in the general population, especially in the large cities, the most marked reduction in the tuberculosis death rate has oc-

DEATHRATES FROM TUBERCULOSIS ALL FORMS

1926 COMPARED WITH 1911

By Color, Sex and Age Periods

METROPOLITAN LIFE INSURANCE COMPANY, INDUSTRIAL DEPARTMENT

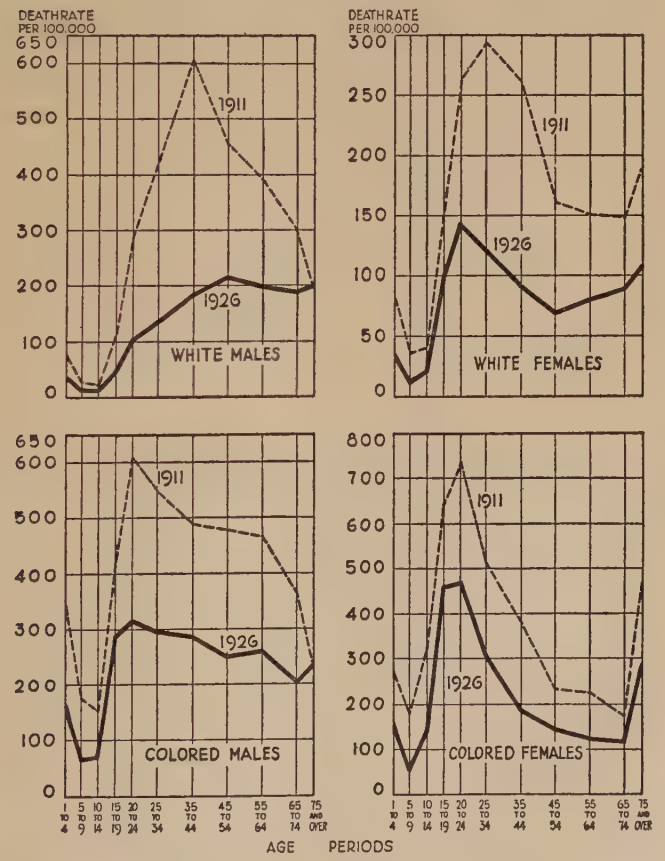


TABLE 6

Percentage Decline in Death Rate from Tuberculosis—All Forms
1926 Since 1911
By Color, Sex and Age Periods
Metropolitan Life Insurance Co. Industrial Department

Age Periods	White		Colored	
	Males	Females	Males	Females
All ages—1 and over	62.7	54.9	44.3	43.0
1 to 4	52.2	59.4	53.4	44.7
5 to 9	58.3	71.2	63.5	71.0
10 to 14	50.0	48.9	55.5	55.3
15 to 19	60.1	37.0	31.1	28.9
20 to 24	65.2	46.6	48.1	36.4
25 to 34	68.0	59.0	46.0	40.9
35 to 44	69.8	65.6	41.5	51.7
45 to 54	53.1	57.0	47.8	39.2
55 to 64	49.5	47.4	44.5	45.4
65 to 74	38.1	40.2	44.9	33.7

curred in the period of early infancy. In the city of New York, the decline in the tuberculosis rate in ten years in the period under age one was 53 per cent, as compared with a decline of 40 per cent at all ages.

On the other hand, the same years which experienced the remarkable decline in the death rate in the United States saw on the continent of Europe an equally decisive rise in the death rate. Incidental to the War and to the miseries which resulted from it, the death rate from tuberculosis in virtually all the countries of Europe rose to heights equaled only in the years before the tuberculosis campaigns. All the

gains of twenty-five or thirty years were apparently lost in the three or four years of war and in the periods of stringency immediately thereafter. In the German cities with populations of 15,000 and over, the death rate, which in 1913 was 157 per 100,000, rose in 1918 to a maximum of 287. Individual cities like Vienna and Warsaw showed much worse conditions. In 1913 the rates for tuberculosis in these two cities were 302 and 306 per 100,000, respectively. By 1917, at the height of the war, these figures had risen to 425 for Vienna and 840 for Warsaw, declining in 1920 to 405 and 338 per 100,000 of population. Cities which, like Belgrade, passed though long periods of military occupation and food stringency showed maximum rates, rising even to the horrifying figure of over 1,400 per 100,000 during 1918. But the high rates did not continue following the resumption of industry and the return of fairly normal conditions. The most recent figures show that the death rates from tuberculosis are back approximately where they were at the beginning of the War and, in some countries, they have fallen to figures well below those recorded prior to 1914. The picture with regard to tuberculosis in the European countries is, however, too well known to require any marked elaboration in this paper.

How shall we interpret these facts both in the United States and abroad? They are no mere chance occurrences, covering as they do so large a group of people and being so different on both sides of the ocean. The figures are just as instructive as to the nature of the

disease as are any of the demographic items to which we have already directed attention. How do they square with the two explanations we have considered? Can the rapid decline in the rate in the United States and the equally rapid increase in Europe be made consistent with the assumption that the constitutional factor is the only vital one in the tuberculosis situation? As we have seen, the very nature of the tuberculosis picture was markedly changed; in the one case for the better, in the other, for the worse. In America, the incidence of the disease by age was so completely changed during ten years that one would hardly recognize the curve for age in 1926 as representing the same disease in 1911. Changes in germ-plasm are fixed by inheritance and cannot be developed in three or four or even fifteen years. They take generations for their fulfillment, and cannot, therefore, offer an explanation for what occurred in the last few years.

Certainly as applied to the United States, there is no evidence that the changes that have occurred in the last decades have come about through any improvement in the racial constitution of the people. The eugenists have not lost an opportunity to say that in their opinion no improvement has occurred and, if anything, there has been deterioration. They have pointed to the decline in the birth rate of the most favored classes, to the extensive immigration into the country of large numbers of less favored people and to the other items that show that the inherent capacity of the population may not have improved. It would seem,

therefore, that if the tuberculosis death rate has declined in the United States, it has not done so because of the improvement of stock during the period under question, but rather in spite of it.

On the other hand, the facts in both parts of the world are not at all inconsistent with the assumption that we are concerned with changes in the environment of the individuals whom we are considering. In America, we see clearly evidences of remarkable improvement in the status of the great mass of the people; the bettering of the conditions under which they must work; the shortening of their hours of labor and the increase of their earnings. From every angle, there is good evidence that the population of America is better off. Never before in the history of the country has so favorable a change come over the environment of the people as in the years subsequent to the Great War. Those who are engaged in the anti-tuberculosis program point to the enormous increase in the effectiveness of their organization, in the multiplication of their facilities for the care of the tuberculous, to the widespread campaign of education which has taken hold of the imagination of the people, affecting not only the school children but the whole of the population.

The losses sustained in the tuberculosis movement abroad are just as clearly related to the marked retrogression in the well-being of the people. There were no fundamental changes in the germ-plasm of the civilian population of Europe, but rather in the number and character of the hardships to which they were

exposed. The lack of food, of clothing and of housing, the many worries and the disregard of hygiene, which could scarcely be avoided, went hand in hand with the mounting death rates from tuberculosis. The changes which occurred in Europe on so large a scale and which were so sharply defined show that there can be no mistake as to the relationship of environment to tuberculosis. The facts, such as they are, are as conclusive as the facts of any laboratory experiment. It is on such grounds that those who consider the environmental factor as dominant, rest their case.

May we not, therefore, conclude from this first section of our discussion that the very nature of the disease as expressed in its differential incidence in the various groups of the population and in its capacity to change is more consistent with the first rather than with the second of the two explanations? It seems to be very clear that taking all of the facts together, we are led into fewer difficulties by this course. The second explanation, which assumes a differential racial constitution and inheritance corresponding to the differences in the death rates, requires in its turn still further explanation. The evidence is good that the factors of immunity and the racial constitution must be considered. But there has not been sufficient change in this regard to account for the reduction in the death rate. Possibly, further research will add to the importance of this factor by identifying certain types of constitution which go with the greater or less ability to resist the development of tuberculosis. But, this

must always remain a minor item in the tuberculosis campaign as it is organized in the United States and in other civilized countries. In the last analysis, it is the kind of environment we live in that determines the high or low rate which prevails.

V

Fortunately, there is at our disposal another and a more direct mode of approach which shows very clearly how effective are environmental influences in the control of tuberculosis. We shall from this point on, concern ourselves with an attempt to evaluate some of the major activities which have been developed in conjunction with the tuberculosis program to see if we can measure how much of the actual decline in the death rate can be directly traced to them.

One of the first steps in the tuberculosis campaign has been to discover the early cases of tuberculosis and to provide care for them. For thirty years the sanatorium movement has developed rapidly and, to-day, in the United States, there are available close to 75,000 beds for the care of the tuberculous. The theory behind this development has been that those who receive such care may have their disease more or less arrested and their lives lengthened. We have been very negligent in not attempting heretofore to evaluate this phase of the tuberculosis movement, for much of the necessary evidence is at hand.

The end results of sanatorium care, quite irrespective

of the location of the institutions, are strikingly similar. Incipient cases give the best promise, although the sanatoria cannot quite wipe out the effects of the disease in even such cases. The records of the best sanatoria of the country show clearly that the after-mortality among the graduates is from two to three times the normal for age. Those who have been admitted in a moderately advanced stage of the disease have a subsequent mortality from eight to ten times the normal for age, and those who have been admitted as "far advanced" cases show a mortality from thirty to forty times the normal for age. These results are not limited to one sanatorium alone, but are typical of sanatoria in general. Patients treated at Trudeau, at Mt. McGregor, in the King Edward VII Sanatorium, do a little better than we have assumed. We have minimized the gains to make them more representative of average sanatorium conditions.

In contrast, the tuberculous, as a whole, have a mortality approximately fourteen to fifteen times the normal for age. This is indicated by the fact that the fatality rate among the tuberculous is approximately 10 per cent, or 100 per 1,000 per year, whereas, the mortality rate of the general population at corresponding ages is approximately 7 per 1,000. An estimate of fifteen times the normal mortality for the tuberculous in all stages is reasonable. It follows, therefore, that the effect of sanatorium care consists in converting groups of individuals who, if left to their own devices, might be expected to die at a rate of fif-

teen times the normal, into groups who die at a rate of from two to three times the normal, as do the incipient; or from eight to ten times the normal, as do the moderately-advanced cases. The far-advanced cases probably receive benefits as well, but their mortality rate is well above the average of the tuberculous, and there is no satisfactory evidence as to the saving actually effected. But even as to them there are other community advantages which justify their care in sanatoria.

Let us see then what the effect of sanatorium care is on masses of tuberculous cases. The best estimates that I can find indicate that about 40 per cent of the beds are available to early and incipient cases, about as many more to the moderately-advanced cases, and the remainder, or 20 per cent, to far-advanced cases. In a typical thousand cases in sanatoria there would then be 400 incipients, 400 moderately-advanced and 200 far-advanced. As the result of the sanatorium care on the above basis, there should be annually, subsequent to discharge, a total of about 90 deaths per 1,000. In the community at large, the number of deaths in a typical thousand of the tuberculous population would be 100. There is, therefore, a net saving of 10 deaths per 1,000 patients per year on the most conservative basis that we can use. This is equivalent to a saving of 10 deaths out of every 100 that would otherwise occur, or 10 per cent in the total tuberculosis mortality. The importance of this saving depends, of course, on the total numbers of persons who receive

sanatorium care. At the present time there are approximately 75,000 beds caring for well in excess of 110,000 patients each year. There is, therefore, a saving of at least 1,100 lives a year as the result of the return to the community of the patients of the preceding year. The number is not quite so large for past years, since the movement for providing sanatorium beds has been a rapidly growing one. In 1904 there were 10,000 such beds; in 1910, these had increased to 26,000, in 1922 the number was about 70,000 and now the number is about 75,000. These beds have an average turnover every six months, but are not always fully occupied throughout the year. The maximum capacity may need to be discounted by perhaps as much as 20 per cent. On this basis, I estimate that not less than 800,000 persons have passed through these sanatoria during the last decade, of whom close to 600,000 are still alive and showing the benefits of reduced mortality in their respective communities. At a minimum, therefore, there are 6,000 less deaths per year from tuberculosis in this group than would have occurred if sanatorium beds had not been available. There are also a considerable number, not easily estimated, who received sanatorium care in prior years, and who are still alive. The saving which has occurred among them will increase the total to well in excess of the 6,000 lives annually which we have ascribed to the effects of sanatorium care. In fairness, however, such gains as we have noted should be credited to the whole tuberculosis pro-

gram of which the sanatoria are only a part. Without the clinics and their expert medical and nursing facilities, the auxiliaries and the social workers, many of the patients would never have been discovered in the early stages of the disease nor admitted to sanatoria, nor kept there until the treatment was completed.

There are, in addition, a large number of patients who receive excellent care at the hands of private physicians, a large number of whom are expert in the treatment of the tuberculous. At Saranac Lake and other centers of the country, large colonies of the tuberculous have gathered where they enjoy much the same type of supervision, direction and care as do those in the best sanatoria. It is, unfortunately, impossible to estimate their number. But that it is large and that the results obtained are in many ways comparable with those of the best sanatoria, there is little question. It is regrettable that no estimates can be made of the saving in lives accomplished through this medium. The number must be large, however, and would add materially to the number already credited to the effects of sanatorium care.

It is not my purpose in this paper, even if it were possible, to exhaust all the major activities of the tuberculosis movement and to evaluate the life saving achievement of each one of them. My purpose has been rather to show how a typical and important agency has actually resulted in a measurable amount of life conservation. That should serve as an indica-

tion of what may be accomplished by the others, although it will always be impossible, I suppose, to determine how much good results from such work. Important as was the first or logical side of our argument, this brief contribution on the direct results is even more important. Together, the evidence should be irresistible that the recent decline in the tuberculosis rate can be largely credited to the agencies which have been put into operation, directly or otherwise, to control tuberculosis.

I do not wish to ascribe the entire gain to the tuberculosis movement. It is entirely conceivable that more has been accomplished through the increase in real wages of the working classes of the country, through the improved working conditions in the factories, and the improved well-being of the great mass of the workers, than from all of the direct activities of the movement itself, such as, sanatorium care, the service of physicians, etc. But, it is to the great credit of the tuberculosis campaign that so much of the enlightenment that now prevails in the relationship between employers and employees has resulted from the intelligent stimulation by health and social workers who have been interested in the control of tuberculosis. The campaign of education has not been waged for naught. Anyone who is familiar with what has been accomplished in this country in the field of health education cannot fail to be impressed with the value of the work. The tuberculosis movement, be it through either its direct or its indirect influences, has made the

body of American men, women, and children more resistant to the development of infection, keener to know the state of their health, more intelligent as to their needs when disease has developed, and more likely to obtain proper and sufficient care. The tuberculosis movement, therefore, stands clearly and outstandingly as a major force in what has been accomplished.

VI

No one can possibly be familiar with the history of public health in the last twenty-five years and be other than optimistic as to the future of the tuberculosis campaign. The experience through which we have passed has clearly demonstrated that the campaign has been well conceived and that the individual activities have been, on the whole, well conducted. The effort has justified itself and is worthy of further extension. Much is still to be desired in making approved facilities available to the great mass of the American population and, even when available, so to coordinate them that the most effective results will be obtained. You will remember that with reference to the effectiveness of sanatoria, everything depended upon their ability to serve the incipient cases first. It was because they succeeded in obtaining 40 per cent of their cases in the incipient stage and the rest moderately advanced and far advanced, that a saving in mortality of 10 per cent could be accomplished. If the sanatoria in the future could succeed, through the

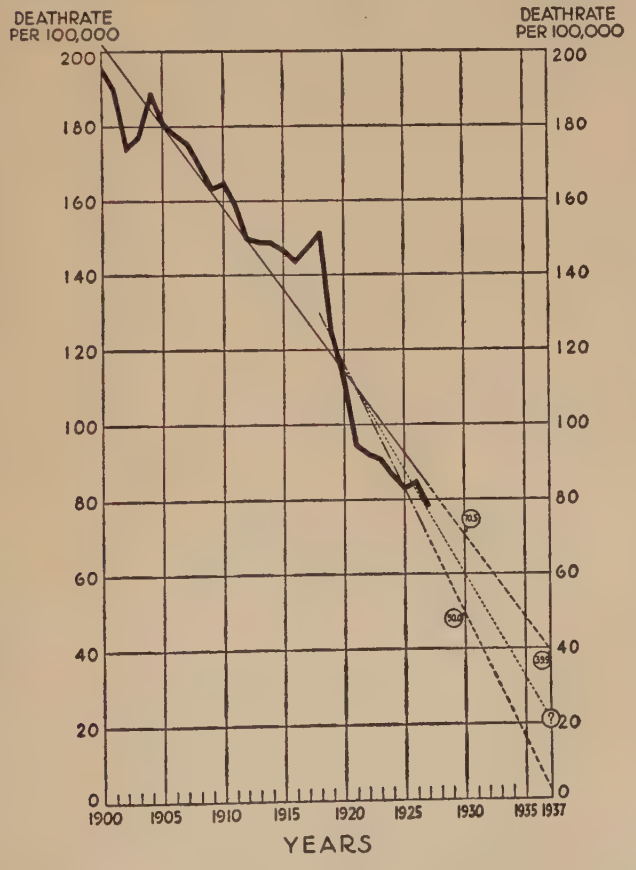
cooperation of the diagnostic and the social service agencies, to bring incipient cases instead of advanced and far-advanced cases to their service, the mortality saving would be materially increased. Even if sanatorium care itself were not made more effective, a change of the present proportions to 60 per cent incipient and 20 per cent moderately advanced and 20 per cent far advanced would increase the annual mortality saving from 10 per cent to 22 per cent per year. Coupled with this internal change in the management of sanatoria, there must be a further development of sanatorium and bed facilities over many large areas of the country. There are still too many states with either no or an inadequate number of sanatorium beds available to the tuberculous. We may look forward, I believe, to a rapid extension of such facilities in the near future.

What, then, may we say on the basis of past experience is the probable trend of the tuberculosis death rate, and what may we expect to achieve in the next ten years, say by 1937? While our data are in many ways trustworthy, there is, nevertheless, an element of uncertainty in making forecasts of this kind. Changes in the tuberculosis death rate are sometimes very marked and unexpected. If, to be conservative, we merely assume that the trend line of the last twenty-seven years will continue without change for the next decade, we may expect a death rate of 70.5 per 100,000 by 1930, and of 39.9 per 100,000 by 1937. I am confident that the first of these estimates,

TUBERCULOSIS - ALL FORMS

Prospective deathrates, 1928 to 1937

Original Registration States and District of Columbia



namely, about 70 by 1930, will prove too high. The decline in tuberculosis in the period between 1918 and 1927 has been at a much more rapid rate than in the prior twenty-year period, and there is every reason to believe that the improvement will continue. If the sharper trend of mortality since 1918 were to continue until 1930, the rate would be just under 50, which is, in fact, the figure we prognosticated in 1922 for the end of this decade. On this more favorable basis the rate for 1937 would be very low indeed; in fact, it would be near the vanishing-point. My best judgment, however, is not to assume too much, but rather to make such prognostications most moderate. I would, therefore, be content with the figure of 40 for 1937, having every reason to believe that the actual rate at that time will be considerably lower. Chart VII on page 131 presents the trends based upon the longer and more recent period of years and our prognostication for the year 1937.

In this connection, it should be remembered that in New Zealand and Australia a death rate from tuberculosis as low as 50 per 100,000 has already been obtained, and in our own country in 1925 no less than seven states had rates below 50, and in fact four were below 40. In view of these figures and the fact that since 1921 the trend line has been very smooth and constantly downward, we have every reason to believe that the time is actually in sight when tuberculosis will no longer be the scourge of early adult and middle life and that it will soon take its position as a

relatively minor cause of sickness and death. It should always be borne in mind that tuberculosis is an infectious disease and that, as such, it is subject to certain limitations which have been found to affect other infectious diseases. There are certain epidemiological characteristics of tuberculosis which may play an important part in the further reduction of the death rate. With fewer deaths there will be correspondingly fewer advanced cases of the disease. A reduction in the number of advanced cases will reduce the number of primary infections, inasmuch as each advanced case is a focus for new infection. It is entirely possible that a point will soon be reached at which the number of new cases, due to infection from existing advanced cases, will be insufficient to maintain the death rate from tuberculosis at anything like a significant level. This suggests, at least, that tuberculosis must either ultimately disappear or become a relatively rare disease.

CHAPTER VI

THE CHANCE OF DEATH FROM CANCER[1]

CANCER as a cause of disability and death is increasing. There is no longer any room for doubt as to that. We have made an analysis of the rates concerning close to 125,000 deaths from cancer which have occurred among the many million Industrial policyholders of the Metropolitan Life Insurance Company between 1911 and 1925, and have satisfied ourselves that a fair proportion of the apparent increase as shown in the annual figures of cancer mortality was real and significant. A parallel investigation by Dr. Schereschewsky, of the U. S. Public Health Service, of the data for the general population of the registration states of the United States has led to a similar conclusion. Competent studies throughout the civilized world confirm these findings. The increase in the death rate from cancer can no longer be explained away on the score of improved diagnosis, or of changing age and race constitution of populations. The facts point unmistakably to a significant increase in the cancer rate.

It is, however, very important to know whether this increase is general or localized; whether it affects both

[1] An Address presented to the International Symposium on Cancer Control, Lake Mohonk, N. Y., Sept., 1926, and printed in *Surgery, Gynecology and Obstetrics,* May, 1927.

sexes or one sex, all age groups or only certain ages; whether all forms of cancer are increasing, or only those which affect certain parts of the body. The rich statistical materials made available by the investigation of the Metropolitan Life Insurance Company have made possible definite answers to these questions.

These studies show that in 1925 cancer was the third cause of death in numerical importance among these Industrial policyholders; only heart disease and tuberculosis have higher death rates. Only five years ago, this condition stood fifth in the list. No better indication of the growing importance of cancer can be given.

II

Over the entire period the increase in cancer has been at the rate of 7 deaths per 1,000,000 persons per year. This increase, however, has not been uniformly distributed. A significant increase has occurred among males only and this applies equally to both white and colored males. The increase among females is very minor and statistically not significant. One may say that the increase of cancer which is observed in the population is almost altogether the result of the condition among men and not among women; although, as we shall see later, this statement must be modified with regard to certain forms of cancer and certain age periods when increases among

females have likewise occurred. Though the increase in cancer has occurred mainly among males, nevertheless more women than men die of the disease at the present time.

Cancer mortality has not been increasing uniformly at the several age divisions of life. At the younger ages, under thirty-five, the death rate from this cause is low and has shown no considerable change during the period under observation. There was probably a slight fall in the death rate between the ages of thirty-five and fifty-five years. It is beyond age fifty-five that the tendency has been significantly upward, and the more advanced the age the greater the rate of increase. In the age period fifty-five to sixty-four years the rate increased .6 of 1 per cent per year, and above age sixty-five, about 1½ per cent per year.

III

But the real crux of the matter lies in the facts for cancers by organs or parts of the body. The death rate for cancer of the stomach and liver for the group as a whole has shown a slight upward tendency which is entirely confined to the males. This is important because these cancers account for 36 per cent of the total deaths from cancer. Since 1922 a very striking increase in the mortality from this form of cancer has occurred among white males.

The female genital organs, next to the stomach and liver, are the most important seat of malignant dis-

ease. They account for 20.8 per cent of the total cancer mortality and for 30.4 per cent of the total cancer deaths among females. Almost all of the deaths classified under this heading were actually due to uterine growths. There has been a practically stationary death rate in this form of cancer during the fifteen-year period. Such increase as has occurred was limited to the advanced ages.

The death rate for cancer of the intestinal tract has, on the other hand, shown a decidedly upward tendency. This amounts to almost 2 per cent per year. The rise has been more pronounced among white than among colored persons. For both white males and white females, the trend was definitely upward after age twenty-five. Among the colored, the only significant rise was found among females in the age group fifty-five to sixty-four years. There was no material change in the course of the mortality from cancer of the breast either among white females or among colored females. It was only in the age period fifty-five to sixty-four among white females that a significant change upward has occurred.

Cancer of the buccal cavity is one of the few forms of cancer which has shown an unmistakable decline even at the older ages of life.

There has been little indication of a significant change in the death rate from cancer of the skin.

There remains for consideration the residual group entitled "Cancer of other or unspecified organs." This is a very important group in America, accounting for

15.4 per cent of all the deaths. Anatomically, the group is very heterogeneous, including the growths of the larynx, of the lung and pleura, of the pancreas, of the kidney, bladder, brain, and other organs. It is impossible to consider each one of these particular forms of cancer because of the small number of deaths which occurred under each head. But, considering the group as a whole, we find unmistakable signs of increasing incidence among males, both white and colored. This tendency toward increase is so striking that it will pay to keep some of these growths under very careful observation in future years.

A discussion of cancer mortality should not, however, be limited to a consideration of the death rates for this disease. These figures, important as they are for a determination of the actual trend of any disease or condition, do not throw much light on what is, after all, uppermost in the mind of the intelligent layman. What he wants to know is, what is his chance of escaping or dying from cancer and what is the total budget for the present generation which cancer can claim either in the United States or any other country under present conditions? That is the main point which we purpose to discuss in this paper.

IV

The decline in recent years in the preventable diseases of youth and of early maturity, such as typhoid fever, tuberculosis, pneumonia, and others, has re-

sulted in a marked change in the proportion and number of persons in middle life and in old age. The life-conservation campaign of the past twenty or thirty years has saved millions of people in the early adult ages and has transferred them to those ages where they are exposed to the effects of cancer, of heart disease, and of other diseases characteristic of the advanced years of life. Under conditions of 1924, for example, over 17 per cent more male persons reached the age of fifty than did in 1910, and over 13 per cent more females attained that age than in 1910. As a result, the total number of cases of, and deaths from, cancer might very well be expected to rise from year to year, even if there were a stationary, not to say an increasing, cancer death rate at each age of life. Our problem is, therefore, to discover a measure of the gross budget of cancer under the changing conditions such as have prevailed during the past fifteen years.

This can be accomplished readily enough through the use of a device known as the life table. Primarily, life tables show what the probability of dying is during each year of life from birth on through the several ages. Having computed these figures, the next step in constructing a life table is to assume an initial cohort of 100,000 persons either at birth, or at the age of ten, and to reduce this cohort year by year, according to the calculated mortality ratios, until the entire group has been claimed by death (see Chap. XV, p. 314 ff.). This process gives us a succession of deaths from all causes at each age interval in the life table from the

initial to the last age. The cancer series which helps to make up the total mortality at each age is then dissected out, and similar calculations of the probability of death from cancer are then made. We have thus treated the deaths from cancer in the years 1910, 1922, and 1924, for each sex in the United States registration states, and we can, therefore, tell for each of these years, at any age, the number of deaths that will occur from cancer at that age and at every subsequent year of life in a life-table population. By dividing the number of such deaths from cancer at and above any given age by the total number of persons in the group at that age, in a life-table population, we obtain the measure of the probability of dying from cancer. In a similar manner, life tables can be prepared for any other of the important causes of death.

Our procedure will be clarified perhaps by referring to Chart VIII which shows the number of deaths at each age from cancer in a life-table population constructed, first, for 1910; second, for 1922; and, third, for 1924. By summing these deaths at and above any age, we can readily determine the total number of cancer deaths that will occur in the group at all subsequent years of life until the entire group succumbs to either cancer or some other cause of death. This chart shows clearly what has happened in the interval between 1910 and 1924 with reference to the number of cancer deaths. Beginning at about the age of fifty and continuing until the end of life, the number of cancer deaths among males has perceptibly increased. At

about the age of sixty-five the actual number of cancer deaths in our life-table population was close to 50 per cent higher in 1924 than in 1910. Among females, the difference is not so great and comes later in life. The increase in the actual number of cancer deaths appears to have begun at about the age of fifty and to have reached its maximum close to the age of seventy.

How strikingly different is the situation with regard to tuberculosis! This we have attempted to show in Chart IX. The tuberculosis death curve for 1924 is the lowest of the three, both for males and for females. In the male sex, the decline from the maximum (at the age of thirty-seven) in 1910 was practically 50 per cent. The area between the upper and lower curves shows how large has been the saving from this improvement during the main working period of life. But this very saving has served to swell the number of persons exposed to cancer and the other degenerative diseases at the ages of fifty years and over.

Following the method indicated above, we have prepared six tables for cancer, one each for males and for females for the years 1910, 1922, and 1924, out of the experience of the United States registration states. These tables show what is the probability of dying from cancer, at and above a given age. We learn, for example, that a boy at the age of ten in the United States registration states in 1924 stood nearly 9 chances in 100 of eventually dying from cancer. There were, of course, 91 chances of not dying from cancer. This probability of dying eventually from cancer,

CHART VIII

Cancer deaths in a life table population in the United States, 1910, 1922 and 1924, among 100,000 persons starting together at age 10.

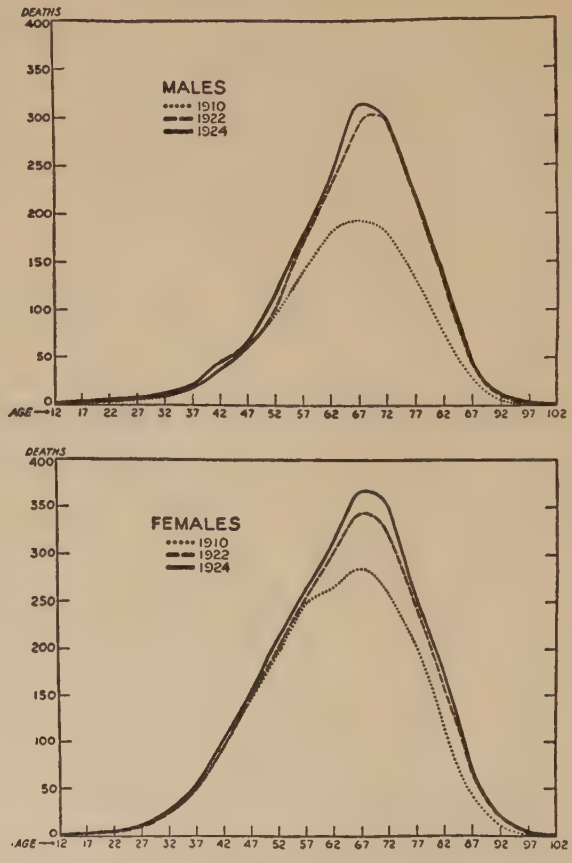
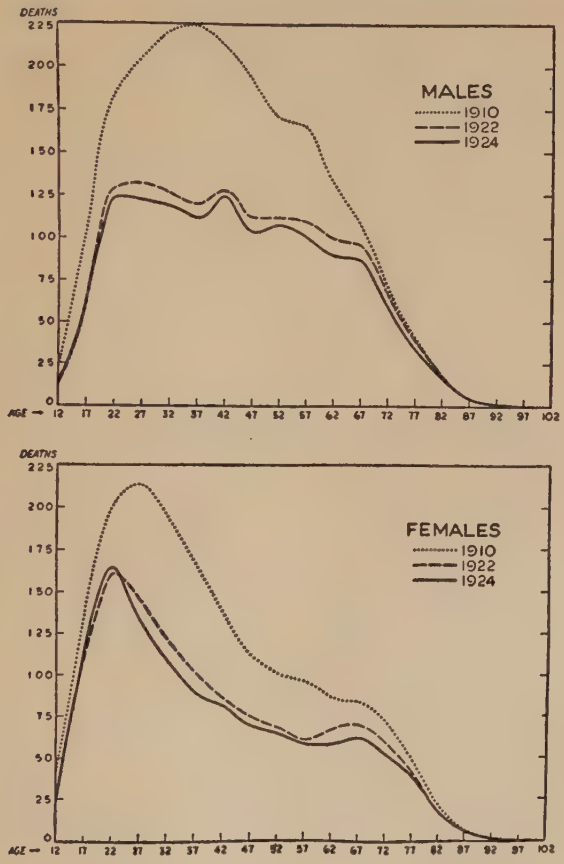


CHART IX

Tuberculosis deaths in a life table population in the United States, 1910, 1922 and 1924, among 100,000 persons starting together at age 10.



namely, 9 in 100, remains fairly constant up to about the age of sixty-five and then declines to the end of life. A girl at the age of ten, on the other hand, under conditions of 1924, has 12 chances in 100 of ultimately dying of cancer. At the age of forty, this probability increases to 13 in 100, after which it declines steadily to the end of life.

TABLE 7

Probability of Dying Eventually of Cancer at and Above Specified Ages. United States Registration Area, 1910, 1922, 1924*

Age	Males			Females		
	1924	1922	1910	1924	1922	1910
10	.0865	.0837	.0587	.1196	.1132	.0985
20	.0887	.0857	.0604	.1223	.1160	.1013
30	.0922	.0891	.0638	.1271	.1206	.1063
40	.0961	.0929	.0679	.1297	.1235	.1095
50	.0991	.0957	.0705	.1255	.1193	.1051
60	.0969	.0928	.0679	.1126	.1064	.0913
70	.0823	.0792	.0563	.0903	.0847	.0708
80	.0570	.0530	.0390	.0617	.0588	.0460
90	.0324	.0285	.0212	.0377	.0370	.0247

*Where the certainty of eventual death from some disease or injury at and above the specified age is denoted by 1.0000.

This set of figures permits us, accordingly, to compare the probability of dying from cancer with the probability of dying from other important diseases. It also permits us to compare the probability of dying from cancer now, with the condition ten or twenty years ago.

V

Let us first see how the probability of dying from cancer now compares with the probability of dying from other diseases. Among males, under conditions

TABLE 8

Probability of Eventually Dying of Specified Diseases or Conditions. Calculations from Experience of United States Registration States, 1924

Sex and disease or condition	Age								
	10	20	30	40	50	60	70	80	90
Males:									
Organic diseases of heart	.1922	.1958	.2029	.2111	.2209	.2310	.2407	.2397	.2084
Cerebral hemorrhage *	.1020	.1047	.1093	.1150	.1223	.1295	.1338	.1248	.0939
Chronic nephritis	.1010	.1034	.1073	.1118	.1168	.1221	.1279	.1253	.1077
Cancer	.0865	.0887	.0922	.0961	.0991	.0969	.0823	.0570	.0324
Tuberculosis	.0642	.0621	.0518	.0418	.0317	.0223	.0133	.0066	.0022
Lobar pneumonia	.0450	.0447	.0437	.0418	.0386	.0350	.0317	.0282	.0231
Bronchopneumonia	.0195	.0197	.0200	.0204	.0209	.0223	.0255	.0312	.0391
Diabetes	.0140	.0141	.0144	.0149	.0154	.0151	.0124	.0081	.0034
Females:									
Organic diseases of heart	.1996	.2027	.2097	.2172	.2249	.2340	.2436	.2409	.2069
Cerebral hemorrhage *	.1168	.1196	.1250	.1315	.1378	.1436	.1481	.1407	.1078
Cancer	.1196	.1223	.1271	.1297	.1255	.1126	.0903	.0617	.0377
Chronic nephritis	.0995	.1014	.1050	.1080	.1100	.1117	.1111	.1026	.0843
Tuberculosis	.0570	.0516	.0381	.0289	.0222	.0171	.0119	.0058	.0022
Lobar pneumonia	.0364	.0363	.0362	.0357	.0351	.0346	.0327	.0290	.0256
Bronchopneumonia	.0235	.0237	.0243	.0251	.0263	.0284	.0323	.0392	.0428
Diabetes	.0227	.0229	.0237	.0245	.0251	.0232	.0161	.0080	.0040

* The figures for cerebral hemorrhage, 1924, are not now available. The figures shown for this condition are those of 1922.

prevailing in 1924, the probability at the age of ten of ultimately dying from cancer was exceeded only by the probability from three other causes, that is to say, cerebral hemorrhage, chronic nephritis or Bright's disease, and heart disease. It ranked fourth among males throughout the rest of life. Among females, however, under the same conditions, cancer was third in the list of causes, being exceeded only by organic heart disease and cerebral hemorrhage, and this was true at the age of ten as at other ages of life.

What change has occurred in the relative position of cancer during the last fifteen years? At and beyond the age of ten, in 1910, in the life-table generation of 100,000 persons, there would have occurred 5,874 cancer deaths to the end of life. In 1924, among the same group of persons at the age of ten, the total cancer budget would have been 8,652. That is to say, the probability at the age of ten of ultimately dying from cancer has increased 47.3 per cent. In 1910, the cancer budget in the life-table generation of 100,000 females at the age of ten was 9,850, but, under the conditions of 1924, that number had increased to 11,957, or 21.4 per cent. These facts are shown more fully in the accompanying Table 9.

For each of the ages beyond ten right up to the age of ninety, for males, there was an increase in the cancer hazard, running approximately from 40 to 50 per cent. Among females, a slightly different picture is shown, with lower increases at the earlier ages and greater increases in cancer probability at the higher ages. At the

TABLE 9

Number of Deaths from Cancer and Tuberculosis in Life-Table Population at and above the Age of Ten. Males and Females in United States Registration States, 1910 and 1924

Cause of death	Males				Females			
	Total life-table deaths in group starting together at age of ten		Increase (+) or decrease (−) 1910–24		Total life-table deaths in group starting together at age of ten		Increase (+) or decrease (−) 1910–24	
	1924	1910	Actual	Per cent	1924	1910	Actual	Per cent
Cancer.....	8,652	5,874	+2,778	+47.3	11,957	9,850	+2,107	+21.4
Tuberculosis .	6,423	10,356	−3,933	−38.0	5,701	8,535	−2,834	−33.2

ages of seventy and eighty, the percentage of increase was well over forty for males, and about thirty for females.

These figures are perhaps as alarming and disconcerting a collection as have ever been gathered on the cancer mortality problem. There has been considerable misgiving over the increase in the so-caller cancer death rate. But, as we have pointed out above, these figures really mask the true significance of the increase in the cancer hazard for the average citizen. We are now confronted with a new situation because of the reduction in the mortality from other conditions, and this is bound to continue; for, with every improvement in the condition of life in the early ages, more and

more people will approach the later period when the population is exposed to the cancer menace. A 47-per-cent increase for males and a 21-per-cent increase for females in so short a time as fifteen years ought to call for a sharp revision of our conception of the seriousness of the cancer problem as it now confronts us. Particularly should the attitude of the medical and public health professions toward this disease be revised. The efforts which have been made during the past ten years to deal with cancer are, in the light of our figures, relatively puny. Where we ought to be spending millions for research, we are spending thousands; where we have a few hundred physicians trained to recognize and treat cancerous states, we need thousands. The recognized facilities for the care and treatment of hopeful cases are pitiably inadequate and unorganized. What are intelligent laymen, physicians, and surgeons going to do about the huge cancer hazard which confronts the average citizen to-day?

CHAPTER VII

THE PROBLEM OF OLD AGE[1]

THE problem of old age is a relatively modern one. It is only in recent decades and in highly advanced countries that we are confronted with large numbers of people who live to old age. Among primitive races and among the ancients, the average duration of life was very low, probably not more than twenty years. This does not mean that a long life was impossible for certain individuals, but rather that the proportion of persons at advanced ages was very low. In India, at the present time, the expectation of life is probably not more than twenty-five years. Life is hard and the great majority are cut off either in infancy, in childhood or in early adult life. Few reach old age. But under conditions of Western civilization, life is much more favorable and large numbers survive to old age. Even before the beginning of the public-health era, in 1840, the expectation of life already reached about forty years in England and about the same figure in our New England. To-day it is in advance of fifty-eight years in our country. Half the population born to-day may expect to reach the age of sixty-six; and one-quarter may hope to reach the

[1] Presented at the seventeenth annual New York City Conference of Charities and Correction, May 13, 1926.

age of seventy-seven. A little over a hundred years ago half the population could expect to reach only eighteen years of age and a quarter fifty-two years. On the other hand, these gains in expectation have brought with them serious questions concerning the status and care of old people. Old age is not an unmitigated blessing, but often from the point of view of the community a serious social question. The economic status of the aged, their relation to modern industrial organization, the character of their disabilities, require careful study. A program aimed to safeguard old age and protect it calls for statesmanship and understanding of a high order.

In this discussion we shall set age sixty-five as the threshold of old age. It is at this time of life that the rates of sickness and of death show marked increases over the previous ages. Most superannuation allowances begin at age sixty-five, whether such provision is made by official agencies or by private employers. Those who have attained age sixty-five have already given the community in many cases forty-five years of productive work and often as much as fifty years, and such persons are entitled to think of themselves as deserving of retirement from active affairs. According to the 1920 Census, there were in the United States close to five million persons sixty-five years of age and over. This represents a gain of nearly a million since 1910. The increase was at the rate of 100,000 persons a year. If the increase between 1910 and 1920 has been maintained, we may

estimate that there are now close to 5,600,000 persons sixty-five years of age and over in the United States. In New York State the number is over half a million persons at this age and in New York City alone the number is approximately 200,000.

II

The proportion of old persons in our population is increasing rapidly under present conditions. In 1890 they constituted 3.9 per cent of the total population. Each succeeding decade has seen an increase, the figures for consecutive censuses being 4.1, 4.3 and 4.7 per cent, respectively. We estimate that the figure is now 5 per cent of the total population, or that one in twenty persons is old according to our present definition. This is the extent of our problem in the United States as a whole. A similar situation prevails in New York State; but New York City is different. New York is the youngest of the great cities of the world. Nowhere else is there so large a proportion of persons at the younger ages, and as a result we find a correspondingly smaller proportion at the older ages. In 1926 we estimated that the older ages constituted only 3.3 per cent of the total in New York City, or one out of every thirty persons. To that extent, the problem of the care of the aged in New York City is less pressing than in the country as a whole. A good indication of the rapid increase of persons at the older ages is shown by the fact that between 1900 and 1920 the

number of aged persons in the United States increased 60 per cent, whereas the total population increased only 39 per cent in the same interval. Two factors account for this marked increase—first, the remarkable decline in mortality at the younger ages which we have already discussed elsewhere; and second, the very heavy immigration of adults, during the last three or more decades, who now swell the ranks of the aged. Immigration explains why 27 per cent of the aged are foreign born and why among the foreign born the old form the highest proportion, 9.7 per cent of all. Among the native population of native parentage, only 4.7 per cent are found at the advanced ages; of these, 92.9 per cent are white and 7.1 per cent colored, although figures for the number of old persons among the colored are always subject to error.

Of the five and one-half million old persons, 70.2 per cent, or over three and three-quarter millions, are concentrated in the ten-year period between sixty-five and seventy-four years. Twenty-six per cent more, or close to one million and a half, are found between the ages of seventy-five and eighty-four. As we examine the later age periods, the numbers and proportions become rapidly smaller until, in the age period ninety-five years and over, there are only about 13,900 persons, forming 0.3 per cent of the total population over sixty-five years. In 1920 there were 4,267 centenarians reported. Of this number, 69 per cent were negroes, which is, of course, far in excess of the relative proportion of the negro in the population. The

stated number of centenarians is grossly exaggerated, since many pretend to attain the hundred-year mark who have no right to that distinction. As our census machinery is improved from decade to decade, the number of reported centenarians has become much smaller.

Sex differences among the aged are particularly interesting. There are about the same number of males and females in the entire group, in spite of the fact that males constituted in past years a much larger proportion of the immigrants. In 1920, in the age period fifty to fifty-four, there were 115 males for every 100 females; in the sixty-five to sixty-nine year group, there were 109 males; between seventy and seventy-four, there were 103 to 100 females. But from age seventy-five onward the relations are reversed and the number of females greatly exceeded the number of males. After age ninety, for example, there are three females for every two males. The increasing proportion of females to males at the older ages is clearly the result of the woman's much lower mortality at the advanced ages; but this statement likewise holds true throughout the entire range of life. Were it not for the heavy additions of male immigrants, females would far outnumber males at the ages sixty-five and over.

III

As the individual gets older, it is obvious that his chances of death increase. At the same time his sus-

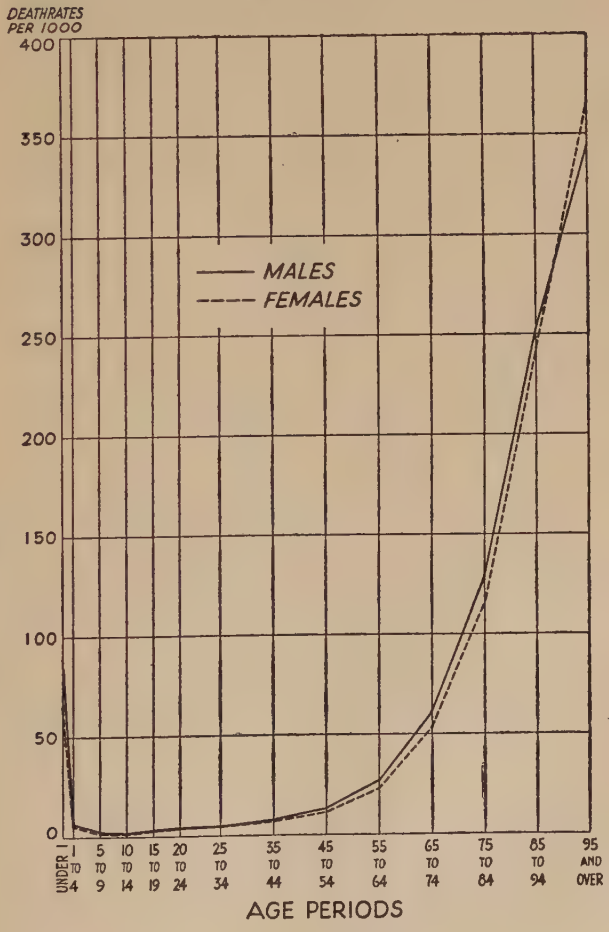
ceptibility to disease also markedly rises. The Metropolitan Life Insurance Company made a number of careful sickness surveys during the years 1915 to 1917 in different parts of the country, and found a general constant sickness rate of approximately 2 per cent for all ages. But among those sixty-five years of age and over it was nearly 10 per cent. This was more than double that for the next younger age group—fifty-five to sixty-four, which in turn already showed a substantial increase over that of preceding age periods. The same finding held true for the different parts of the country. Irrespective of location, persons at these ages lose about thirty-five to forty days a year because of sickness, and the older they become the greater the amount of disabling illness from which they suffer. Chronic invalidism and extreme old age are virtually synonymous. Not only does sickness increase with age in geometric progression, but conditions such as rheumatism, heart, and kidney diseases, which produce illness at the advanced ages, are in many cases serious, expensive and protracted. After age sixty-five we are concerned not only with the results of infection and of accidents, but, even more important, with the breakdown of the internal organism. The old machine gets worn out and apparently very little that medicine has been able to accomplish thus far has improved health during the period of old age.

Mortality as well as morbidity findings for persons in the older ages are of special significance because they determine, in large measure, the amount of care

CHART X

RATES OF MORTALITY, 1925.

United States Registration States of 1920



which the aged receive. Because of the extraordinarily high mortality at these ages, the care of old people is of limited duration. The chart on page 155 presents the rate at which males and females die at all ages of life after sixty-five. The curve at the beginning of the period of old age changes its direction and forms a very sharp angle to that for the main working period of life. In 1925 the mortality rate in the registration states of the United States for persons sixty-five years and over was 82.6 per 1,000 living. In other words, one out of every twelve died in the course of the year—a situation quite like that found in the first year of life. The probability of dying increases very rapidly with age. In the period sixty-five to sixty-nine years, the rate is 48.0 per 1,000, or just less than 5 per cent a year; between seventy-five and seventy-nine it is nearly 10 per cent; between eighty-five and eighty-nine, 21 per cent, or one out of every five persons living. Thereafter the rates are based on small numbers and no great significance can be attached to the figures, except that the living and dying tend to approximate one another in number. The death rates for males are uniformly higher than those for females.

Perhaps more instructive are the facts concerning the expectation of life at the older ages. According to the tables recently prepared by the Bureau of the Census, persons at age sixty-five may expect an after-lifetime of twelve years; at seventy-five, seven and two-tenths years, and at eighty-five, four years. Thus in one essential regard the period of old age is different

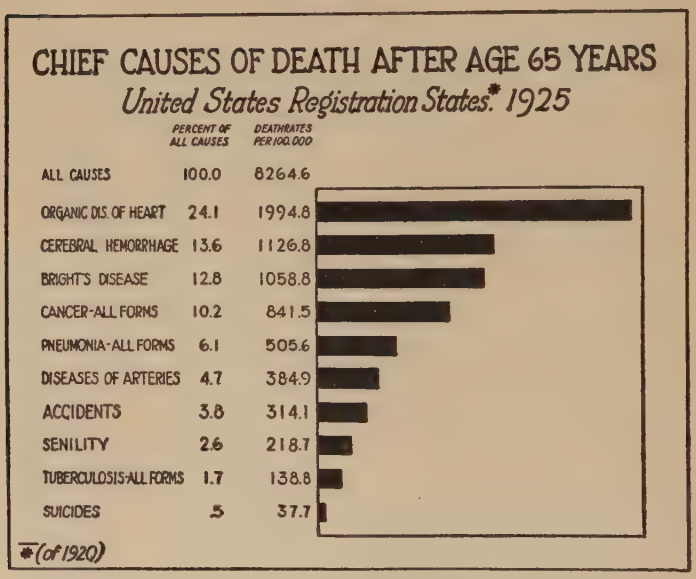
from all the other ages of life; that is, its mortality has not improved. Twenty-five or thirty years ago children were dying twice as fast as at present. There has been a very marked decrease in mortality throughout the period of adolescence and of early productive life. To a lesser degree, this gain has been maintained during middle life. But in the period of old age the improvement is almost entirely negligible. For example, in 1901 the expectation of life at age sixty-five was 11.86 years; in 1920, the expectation had increased to 11.97 years, scarcely enough to talk about —one-tenth of a year, or approximately a month.

The span of life is fairly definitely fixed. If one had charge of a large number of old people it would be necessary to think only in terms of this average duration of the after-lifetime, beginning at age sixty-five. Provision for the aged made on the basis of the life tables has very little chance for error. On the other hand, the very improvement in mortality at the younger ages makes a great difference in the proportion of persons entering old age. Under conditions of 1901, out of a total of 100,000 persons born, 40,911 would arrive at age sixty-five; but in 1925 there would be 51,816 reaching old age out of the original 100,000. We may say, then, that at the present time, or rather under mortality conditions such as now prevail, and assuming that immigration ceases altogether, a person has a little more than an even chance of arriving at the threshold of old age.

IV

The diseases and conditions which produce illness and death at the later ages present a picture rather different from that at other age periods. Some diseases are preëminently those of old age. Organic heart dis-

CHART XI


CHIEF CAUSES OF DEATH AFTER AGE 65 YEARS
United States Registration States* 1925
PERCENT OF ALL CAUSES
DEATHRATES PER 100,000
ALL CAUSES 100.0 8264.6
ORGANIC DIS. OF HEART 24.1 1994.8
CEREBRAL HEMORRHAGE 13.6 1126.8
BRIGHT'S DISEASE 12.8 1058.8
CANCER-ALL FORMS 10.2 841.5
PNEUMONIA-ALL FORMS 6.1 505.6
DISEASES OF ARTERIES 4.7 384.9
ACCIDENTS 3.8 314.1
SENILITY 2.6 218.7
TUBERCULOSIS-ALL FORMS 1.7 138.8
SUICIDES .5 37.7
*(of 1920)

ease stands out as the first cause of death in old age, being responsible for 24.1 per cent of the entire mortality; cerebral hemorrhage and apoplexy account for 13.6 per cent; Bright's disease for 12.8 per cent; cancer for 10.2 per cent; pneumonia for 6.1 per cent. Together, these five causes are responsible for 66.8 per cent of all the deaths occurring after age sixty-five.

Tuberculosis, which is of course most prominent in the working-period of life, plays an important part in the later years also and causes 1.7 per cent of all deaths. The death rate from tuberculosis is almost as high in old age as it is at age twenty-five. Its relative importance is, however, overshadowed by the increased mortality from the other causes. Suicide shows its highest rate in old age, and accidents also play a rather important part. It is interesting to find that senility is considerably less important than accidents as a cause of old-age mortality. Possibly the newer developments in preventive medicine will change this picture. The prevention of infections in childhood and in early adult life should reduce the number of chronic disorders in later years. And the wider practice of good personal hygiene should often postpone for a good many years the breakdown of the heart, the kidneys and the blood vessels. Only through these means is there much hope of extending the span of life appreciably—that is, for a number of additional years.

But if preventive medicine will continue to increase the number of those arriving at the threshold of old age and will keep them alive for a longer time, it is important that provision be made for their maintenance under conditions of decency, if not of comfort. The conditions of industry until very recently have not been altogether favorable to the ageing wage-earner. The average industrial worker is already old and worn out when the farmer is still considered, if not in his prime, at least a productive agent. The

introduction of new machinery and automatic processes makes experience of less value. The extraordinary advance in power equipment demands alert young men, and in periods of unemployment the younger workers are more likely to be retained and the older ones released. Dr. Devine sums up the case eloquently in the following words: "It is notorious that the insatiable factory wears out its workers with great rapidity. As it scraps machinery so it scraps human beings. The young, the vigorous, the adaptable, the supple of limb, the alert of mind, are in demand. In business and in the professions maturity of judgment and ripened experience offset, to some extent, the disadvantage of old age; but in the factory and on the railroad, with spade and pick, at the spindle, at the steel converters, there are no offsets." And the testimony of census figures confirms this latter point of view. We have already noted the increased number of persons reaching the advanced ages. At the same time that this is true, there has been a steadily decreasing proportion of these older workers gainfully employed. In 1890, 73.8 per cent of the males sixty-five years of age and over were gainfully employed; in 1920 the proportion had been reduced to 60.1 per cent—a decline of almost 14 per cent in thirty years. In other words, while modern hygiene increases the number of old persons, modern industry is less and less inclined to use them. This is why the economic difficulties of the aged have become more acute.

Unfortunately, there is little accurate information

to answer the question at what age a man should be retired from active life. Yet there is no logical reason why the increased use of machinery, which requires no severe physical strain to operate, should not lengthen, rather than shorten, the active working period of life. Though a man engaged in heavy manual labor may find his strength declining after the age of forty-five, the engineer of a traveling crane, with his greater experience and caution, may be better at his job at sixty than he was at thirty. There are many other occupations where this must be true. Nevertheless, there is to-day in all lines of work clerical as well as manual labor, a very widespread and intense prejudice against the employment of older workers. This problem has now reached the acute stage and is seriously occupying the attention of engineers, efficiency experts, and social workers who must daily cope with the attempt to find work for older individuals or handle the grievous social consequences of the nonemployment of such persons. There are many instances on record of middle-aged men and women who find it extremely difficult to get a new job because of their age, even though it is obvious that they have many years of useful work ahead of them. Probably there is no greater tragedy in modern life than this forced retirement of workers still in the prime of life—and the waste for society in general is too obvious to require comment. Undoubtedly the increasing tendency of firms to provide pensions for aged workers is an important factor in the situation. It would seem the part of wisdom to devise some

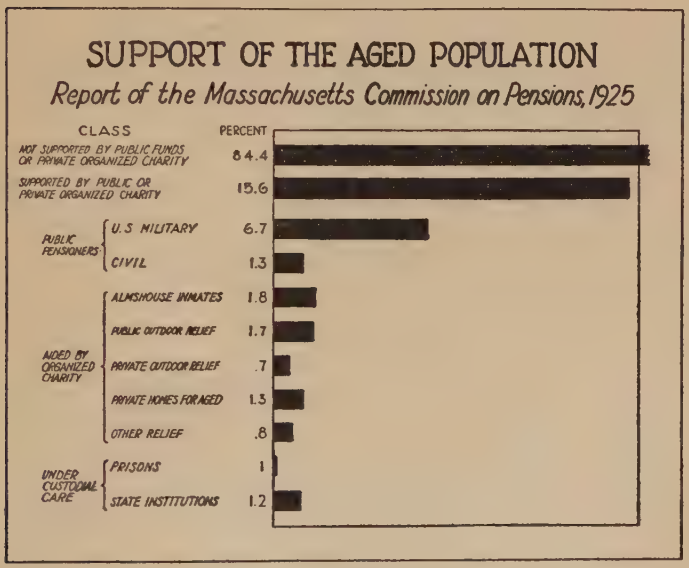
kind of a pension plan which, based upon sound actuarial calculations, could nevertheless make some arrangement whereby the older worker would not be scrapped just because he has passed a certain birthday, provided he still has his health and skill. Since America is a nation of workers, the forced retirement of so many able-bodied individuals is especially serious.

V

Turning now to another side of essentially the same problem, let us consider the economic status of those at advanced ages. It is almost impossible to say definitely how large a proportion of the aged are dependent upon the state, organized private charity, or relatives and friends for their support. Social statistics of this kind are always bound to be elusive and only a few states have made any effort to collect such information. The excellent report of the Commission on Pensions of the Commonwealth of Massachusetts, issued in 1925, points out that need among the aged population was considerable and called for a constructive program designed to protect the aged from hardship and obviate the stigma of pauperism. The outstanding fact of the report is that 84.4 per cent—in other words, five-sixths—are nondependent aged persons, or more accurately, are persons not supported by public funds or by private organized charity. The other sixth are the recipients either of United States military or civil pensions, or are persons aided by or-

ganized charity or are under custodial care. Military pensions account for 6.7 per cent of the total; federal and other forms of civil pensions, 1.3 per cent; organized charity in the aggregate accounts for 6.3 per cent; and custodial care for another 1.3 per cent. This is a very different picture from what we have been led to believe was the condition. Only eight or nine years

CHART XII



ago there was the general belief that one out of every four persons sixty-five years of age and over was supported by public or private charity. But this is obviously not correct. It must not be supposed, however, that those who are classed as "nondependent aged" are absolutely on their own; over 65 per cent

of those interviewed who possessed less than $5,000 in property and incomes of less than $1,000 a year, were partially or entirely supported by others. Seventeen per cent of these so-called nondependent persons had absolutely no income and were supported by children, other relatives, or friends. Thirty-two per cent had annual incomes of less than $400—the minimum upon which life can be maintained decently. Children, in the main, are responsible for the support of these people. The report shows, for example, that 100 nondependent aged persons have 260 children living, whereas 100 almshouse inmates have only 62 children living. The presence or absence of children determines in many instances whether the aged persons become dependent or nondependent in the technical sense. It is quite obvious that in the future the current picture will be largely changed because there will not be so high a proportion of children living to take care of their aged parents. If you would keep out of the poorhouse, have a large family of children.

Another interesting item in the Massachusetts report is that almshouses are to a large degree infirmaries. They account for about 2 per cent of the total aged persons. To this number should be added those in the state institutions for the insane, who account for a little more than 1 per cent. In this connection one should point out that the provision made at the present time for the aged sick is most inadequate and that many old persons are forced to almshouses because they have no other place to go for care during illness. Very

few hospitals admit chronic cases, and in most instances old peoples' homes will not accept those failing in health. Illness has been found to increase with age in geometric progression, and consequently is a far more serious problem among the old than among any other age group. Only 2.8 per cent of those sixty-five years of age and over in almshouses were in good physical and mental health. At the same time, facilities for their care are almost non-existent. The Commission recommends the erection of infirmaries to care for persons with chronic diseases and the aged and infirm who are able to contribute something to the cost of their maintenance—for example, seven dollars a week. These persons would not be entirely dependent on charity, but the state would be helping them out in old age by furnishing them with care and proper hospital accommodations.[1]

[1] After this paper was revised for publication we received copy of a parallel study which the Industrial Welfare Department of the National Civic Federation has just completed on the extent of old age dependency in eleven representative industrial cities in New York, New Jersey, Pennsylvania and Connecticut. The findings were very similar indeed to those of Massachusetts and prove the general reliability of the figures we have already quoted. The slight differences in the amount of dependency found are probably due to the fact that the Civic Federation deliberately and wisely chose an economic group which included, wherever possible, professional and clerical workers. In short, the Federation tried to select a group typical of the population as a whole and not restricted to manual laborers and the poorer-paid wage-earners. It was found that 25 per cent of the 14,455 persons, sixty-five years of age and over, interviewed possessed property worth over $10,000; 42 per cent had $5,000 invested in property; but 30 per cent owned no property at all, and 17 per cent had neither property nor income. Sixty per cent claimed to be entirely self-supporting; 39 per cent were aided by children, relatives, or friends, but of this group, between 20 and 25 per cent were practically totally dependent; and only 1 per cent were dependent upon public or private organized

The present interest of the community in the solution of the old-age problem is acute. But before a wise program can be planned it is essential to know the facts, note present tendencies, and forestall the changes that are likely to occur in the immediate future. We have attempted to give the available figures in the preceding pages. And though we do not intend to sketch a program of action, there are a few suggestions that we may offer without going too far afield. In this country, with its high standards of living and unusual degree of economic well-being, possibly the best solution will come through the encouragement of thrift among the great mass of working-people and the development of pension plans in industry as part of the ordinary functions of management. Two cautions must be borne in mind when installing pension plans; first, that the rights of the workers shall be protected through the state regulation of pension systems; and second, that such plans shall not scrap workers while they are still industrially useful, as they too often do at the present time. We feel that private initiative is sufficient to cope with this phase of the problem and there is little need for government intervention. According to the report of the Massachusetts Commission only a comparatively small number of persons (probably never more than 25 per cent) would be eligible for old-age pensions of the size which most American

charity. The last statement is slightly misleading, however, as no institutional cases were included in the study and consequently the proportion actually dependent upon charity would be higher. But in the main this appears to show the extent of old-age dependency.

states are able to afford. More liberal provision would, of course, increase the number granted pension relief. When all sides of the situation are considered, however, we very much doubt whether a state old-age pension plan is the solution of our problem, since the expense of such legislation will, of necessity, be very high, the exact cost depending, naturally, upon the type of legislation passed. It has been estimated that in Massachusetts the cost of providing pensions to citizens sixty-five years of age and over who resided in the state fifteen years or longer and who possess property less than $3,000 and an annual income of less than $365, would amount to from fifteen to sixteen million dollars a year. There would be savings to public and private charitable organizations of approximately $1,600,000, or about 10 per cent of the total cost. The commission at the same time points out that the granting of old-age pensions does not do away with the necessity for almshouses. Certain of the present inmates of such institutions who have no close relatives living would still have to be cared for in this way, since they are too old and infirm to shift for themselves.

But if governmental old-age pensions do not provide the best way out of our difficulty, some other method must be found. We must be prepared to assist an ever-increasing army of the aged, since greater numbers will safely pass the hazards of youth and survive to old age. Simultaneously, the number of children per family will probably continue to decrease

and as a result there will be fewer persons in the community able to share the added burden of old-age support. Nevertheless, the American people will not shirk its responsibility; for in the care of the aged we express our altruism in its highest form.

CHAPTER VIII

THE GREAT AMERICAN FAMILY

THE United States to-day contains the most rapidly evolved aggregation of people in the world. Few countries present so interesting and colorful a story of growth and development. Never before have so many different races and so many divergent traditions been blended into a single national entity. A biological and sociological experiment on a vast scale has been consummated with a success undreamed of by the founders of the Republic. Before it is too late and the record blurred, it will be well to examine some of the important elements in the picture to see how they have interacted to make the composite we call *America.* Obviously, we cannot hope to discuss completely the questions inherent in American demography; but we shall attempt to present the significant features in the composition of our people, their numbers, their age and racial groupings, their distribution over our farms and in our cities, the trend of our marriage and divorce rates, our birth rates and death rates. These movements of population show clearly how the existing social fabric of our nation has been determined and what the future is likely to hold in store for us.

II

The period of settlement began in 1607 with the operations of the Virginia Colony and continued for a century and three-quarters, when the United States came into being as a nation. During the first decades, the Colonies sprang up and grew like mushrooms, as shipload after shipload of Colonists landed here. In fifty years the settlers numbered 50,000. Conditions of life soon became easier and more stabilized and the communities grew more from natural increase than from new arrivals from the old country. During the next 125 years a steady increase in numbers of about 35 per cent each decade occurred, or enough to double the population each twenty years. At the time of the first Federal Census, in 1790, we numbered nearly four millions and it is from this nucleus scattered along the eastern seaboard that the great world power of to-day with its 120,000,000 inhabitants has grown. We have, therefore, multiplied about thirty fold in 135 years. Our count has doubled, on the average, once every twenty-seven years during the life of the Republic. The first seventy years were especially conducive to rapid multiplication. None of the usual checks to population increase were operative. Food was plentiful and there was elbow room for all. The frontiers of a new empire were being extended to the western ocean. The whole nation reflected an expansive spirit. But the Civil War put a sudden and severe check to all this. Immigration and the birth rate both dropped

and the death rate rose sharply. Never again was the country to see such increase as antedated the struggle between the North and South. Each succeeding decade has accentuated the tendency toward more moderate growth. The rate is now less than half what it was about a half-century ago. But even under present conditions the population of the United States should double in about sixty years.

The rapid increase of the American people has resulted from two causes. The first is the excess of births over deaths; the second is the excess of immigration over emigration. The first of these factors was more important during the early history of the country; the second had its greatest influence in more recent decades. At the beginning, the American people were very prolific. Large families were the rule, the average number of children per family being seven or eight. On the whole, the country was an open and healthy one and the excess of births over deaths was very great indeed. The multiplication of the native population determined the character of our national life and assured the maintenance of the political, legal and social institutions of the English founders. As the Eastern seaboard became more thickly settled, a natural overflow of population moved over the prairies and established America as the great agricultural state. On the other hand, the immigration movement of the last sixty years located largely in our cities and was instrumental in developing our industrial system. American industry grew by leaps and bounds through

the energy contributed by the recent newcomer. As a result, our cities are often foreign in character and outlook. A host of problems of maladjustment and of faulty assimilation have arisen with which our communities must contend. The more progressive now realize that they should translate America to the immigrant and in turn absorb the best qualities and traditions which the foreigner has brought with him from abroad.

America is rapidly becoming urban in character. In 1790 a negligible percentage lived in the cities. Forty years ago, 35 per cent of the population lived in such places, but at present just over half of the population reside there. These cities not only attract almost all who come from abroad, but also immense numbers of young natives tired of life on the farms. There are now six cities in the United States each with over a million people. The eighty-three cities of 100,000 or over, together contain 37,000,000 inhabitants, close to a third of the whole population. The tendency is still distinctly toward greater urbanization. It is clear, however, that this movement cannot continue long unabated; for at the present rate of change, the entire population will have moved from the farms in less than two more centuries. Adjustments, however, are already in sight. The general use of automobiles on the farm, the building of good roads reaching out into every nook and corner of the country, the radio, the extension of cheap electric power to farms making possible the employment of farm machinery and of

labor-saving devices, together with the increasing prices of farm products, will make life there much more attractive. We need have no great fear of losing the source of our sustenance, although this great problem calls for immediate and statesman-like consideration.

The northeastern section of the country contains the largest concentration of people, over 60 per cent of the total living in the states north of the Mason and Dixon line and east of the Missouri River. This area is still growing faster than any other. A little over 30 per cent live in the South. A little under 10 per cent live in the Rocky Mountain and Pacific states, although these contain more than half the land area of the entire country. Altogether, the United States is still a sparsely settled country. In 1920 it contained only 35 people per square mile as contrasted with 701 in England, 191 in France, and 347 in Germany. A density of population here equal to that of England would give us a total of two billion inhabitants! We cannot as yet talk of over-population in the United States.

III

The huge European migration to America during the nineteenth century was perhaps the most striking characteristic of the epoch. There are no official figures of immigration prior to 1820, but the movement was only a minor one. It increased after 1830 and passed the

100,000 per year mark for the first time in 1842. In 1846, the great Irish potato famine occurred, and during the next ten years more than a million and a quarter Irish immigrants came to the United States. A second large influx of Irish came over in the 'eighties. They located largely in the cities of New York, Boston, Chicago and San Francisco, where they soon dominated the political life. A very large migration from Germany occurred during the same years and determined the character of many cities in the Middle West, such as Cincinnati, Milwaukee and St. Louis. England and the Scandinavian countries likewise contributed large numbers during the middle years of the century. During this period those from northern and western Europe comprised almost the entire immigration.

In 1880 a significant change in the racial character of our immigration occurred. In that year migration from Italy first became noticeable. In 1900, over 100,000 Italians reached our shores. Simultaneously came the great increase in the number of Russians and Poles (particularly Jews), Czechs, Serbs, and other inhabitants of southern and eastern Europe. This movement became more and more pronounced, and by 1896 the "new immigration" accounted for more than half of the total. The rapid growth of Pittsburgh, Buffalo and Detroit can be very largely traced to the Slavic contingent; while New York, Philadelphia and Chicago took on a distinctly Jewish and Italian appearance. In the years between 1901 to

1910, the last decade before the World War put a stop to immigration almost altogether, this immigration from southern and eastern Europe had grown to the amazing average of 72 per cent of the total. By 1920 the foreign stock—that is, those of foreign birth or of foreign parentage—amounted to close to thirty-six and a half millions, or over a third of the entire white population. Of these, a fifth were from Germany, a little more than a tenth each from Ireland and Russia; Italy was a close follower with almost a tenth; Austria and Hungary together gave close to another eighth; England, Scotland and Wales, a twelfth. Less than 30 per cent came from a host of minor countries.

As a result of the recent immigration legislation, not only have the numbers of immigrants been sharply reduced, but there has been a marked shift in the source of the newcomers. Those from northern and western Europe are now favored, while those from southern and eastern countries are almost entirely eliminated by the quota regulations. Immigrants from English-speaking countries once more represent almost half of our annual net gain from immigration. Italians are actually declining in numbers because more are returning to their native land than are coming here. One of the first effects of the new immigration policy was the curtailment of the supply of common labor, and especially of domestic servants. Before the war, European immigration furnished a very large proportion of such workers. Within the last few years

there has been a large immigration of Mexican peons and of negroes from the Southern farms and from the West Indies seeking to fill the gap left by the heavy reduction of European workers. Whether these will prove satisfactory substitutes for Europeans remains an open question and one which cannot be solved without seriously considering the ultimate effect upon social conditions in our Northern industrial centers and upon Southern and Western agriculture. Especially will it be necessary to consider the effects of the curtailed supply of domestic servants on family welfare. Few as yet realize how potent this force is in reducing the size of families and in other ways mechanizing and drying up the sources of normal family life.

IV

The American people are still increasing in numbers. The annual additions from immigration amount to more than a quarter of a million, even under the present restrictive immigration law. The excess of births over deaths is still a million a year or about 1 per cent of the total population. The birth rate is now 21 and the death rate about 12 per 1,000. In the early decades of the nineteenth century, the birth rate was probably not less than 50 and the death rate around 20 per 1,000 per annum. Even fifty years ago, the birth rate was close to 40 per 1,000, or nearly twice as high as it is now. The present rate would be still lower were we not reaping the benefit of the relatively

high birth rates of past decades, which gives us a disproportionate number of persons in early adolescent and middle ages. Time and the new order will correct this situation, however. Just how far our declining birth rate will go it is difficult to say. Birth-control knowledge is rapidly spreading to all classes of our society. This fact, coupled with the declining number of immigrants, who are, for the most part, young people, will undoubtedly retard the rate of increase. Consequently, we may look before very long to a stationary, perhaps to a declining, population in the United States. Even with our low mortality rates, it requires an average of close to four children per mother for the population to reproduce itself, and there is only a very slight margin at the present time. If the present policy of restricted immigration and the sentiment favoring small families continue for another decade or two, our population will certainly become stationary in numbers. Much will depend, of course, upon the reaction of the public mind to the newer conditions. When these have become generally known and appreciated, it is entirely possible that the public attitude toward both immigration and the size of the family will materially change.

What the ultimate population of the United States will be remains an open question. Professor Pearl estimates that our maximum will be attained in the year 2100 and that it will then be close to 200,000,000. Other estimates based on the possible food production of an amount adequate to support a decent standard of

living indicate a larger maximum, reaching as high as 300,000,000 and even more. In the last analysis, the size of our population will depend on economic and social conditions in other countries, on the course of discovery and of invention, on the standards of living which our people demand, on the growth of our cities, on the productivity of our agriculture, and on other factors too numerous to mention.

No one can prognosticate safely in view of the many uncertain variables. But it is certain that a rapidly increasing population goes hand in hand with a progressive and youthful spirit. Where the proportions of young people is large, marriage and birth rates are generally high. Young people have a progressive viewpoint and a marked capacity for achievement; they overcome difficulties; they hew out new paths; they try experiments and impart to a civilization an air of optimism and of cheerfulness. This contrasts with the more sedate and static atmosphere pervading a population either stationary or declining in numbers and one which is more largely peopled by old folks. On the other hand, a rapidly increasing population brings with it a multitude of harassing problems. Cities grow so rapidly as to get out of hand and intolerable conditions of congestion with their attendant evils result. The advantages of city life are often very dearly bought and will continue to be so until we learn how to plan our growing communities scientifically and provide sound housing, transit, and educational programs.

V

We have thus far considered the composition of the population as a whole. We may now examine such facts as we have on the many sub-units or families which, taken together, make up the American people. It is the family which forms the foundation of civilized life and which determines the well-being not only of the individual, but that of the nation as a whole. It is somewhat disconcerting that our facts on the family are largely derived from Census returns, and these do not quite correspond to what we might call "natural" families. Nevertheless, the government figures will serve very well to show the main trends of family organization in our country. There are now approximately 27,500,000 families in the United States, making an average of four and three-tenths persons in the family group. The size has been decreasing slowly and regularly since 1850, when there were five and six-tenths persons in the family. The largest families are found in the South; the smallest on the Pacific coast; the other geographic areas show very little variation from the average. In general the urban is smaller than the rural family. It would be interesting to know the size of families classified according to the color and nativity of the parents; but, unfortunately, these figures are not available. We do know, though, that families of immigrants are usually much larger than those of our native stock, ex-

cept in the rural South and Southwest, where large native families still prevail.

Families are formed through the institution of marriage and are broken by death, divorce or separation. In 1925 there occurred in the United States 10.2 marriages for each 1,000 of population. Since every marriage involves two persons, this means, in effect, that there is each year one marriage for every fifty people in the United States. In 1887, the first year when marriage statistics became available for the country as a whole, the rate was 8.7 per 1,000. Since 1905 the marriage rate has been above 10 per 1,000. It is safe to say that, on the whole, the marriage rate has increased slowly but consistently during the last forty years. This increase, moreover, is manifest at every age division of life. There has also been an increase in the average age at marriage, as shown by the figures for Massachusetts. In 1926 the average age of marriage of men was twenty-nine and five-tenths and of women, twenty-six and one-tenth years. Both of these figures are a half year higher than they were only sixteen years ago. The highest marriage rates occur in the southern section of the country, Florida showing the highest figures. Delaware, on the other hand, shows the lowest. The figures vary somewhat from state to state, according to economic conditions, the age constitution of the population, the prevailing industries, and other characteristics.

Our marriage rate of a little over 10 per 1,000 people is fairly high as compared with other countries.

England and Wales in 1924 showed a marriage rate of 7.7; Germany in the same year showed even a lower figure, namely, 7.1. These low figures reflect the unfavorable economic conditions in these countries since the war. Women at the marriageable ages are in great excess in both of them, and it will require several decades of peace and prosperity to restore the balance. The opportunities for marriage in America are undoubtedly very favorable both because of the age and sex composition of the population, and because of the excellent economic situation now prevailing throughout the country. Marriage rates are among the first to reflect the state of well-being of the people, rising and falling with conditions of employment and wage levels.

VI

The same conditions which make our marriage rates high have made our death rates remarkably low. The mortality rate here has always been low as compared with that of other countries. The American people were recruited from hardy stock. After the country was settled, conditions of life were, on the whole, conducive to longevity. But few official figures on mortality are available for the formative years of the Republic. The general death rate was probably about 20 per 1,000 in normal periods of the early days. When, as often happened, epidemics of various diseases, such as smallpox, yellow fever and cholera, pre-

vailed, the rate shot up to 30 and even 40 per 1,000. The rates were higher in the cities than on the farms, although on the Southern plantations, malaria could often be counted on to increase the mortality.

The development of the public-health movement, beginning, say, fifty years ago, changed the situation. Under the direction of health workers and the medical profession, infections came gradually under control. The sanitation of our water supplies, the protection of our milk and food supplies, popular education in personal hygiene, the training of mothers in the care of their babies, the improvement in the conditions of labor, the extension of our cities and the building up of suburbs, have had a marked effect in reducing the mortality and increasing the span of life. The death rate has been reduced at least 60 per cent during the last forty or fifty years. In 1900, the first year of official death registration, the rate was 17.6 per 1,000. In 1925 the death rate was 11.8, representing a fall of 49.2 per cent in a quarter of a century. To be sure, the improvement which has brought this mortality figure down has been largely among young people. Infant mortality is less than half what it was twenty-five years ago. Then one out of every six babies born died before it was a year old. Now we find fault when one out of every fourteen babies dies in its first year of life. The mortality of children in their 'teens, of school children and adolescents and even of young adults up to age thirty-five, has shown considerable improvement. Tuberculosis has been markedly re-

duced as a scourge of young and even of middle-aged people. Typhoid fever, diphtheria, scarlet fever have rapidly diminished and promise to become, ultimately, as rare as yellow fever and cholera are to-day in the United States. The outlook for the future is very promising indeed.

The effect of the reduction in mortality has been to lengthen the average duration of life, or what is technically called the expectation of life at birth. In 1840 it was only forty years, but since then the expectation has gradually crept up and now it is about fifty-eight years. The gain is close to 50 per cent in this comparatively short period of time. Only Australia, New Zealand and Scandinavia enjoy a longer expectation. One point must be made clear, however. The lengthening of the life span—that is, the capacity to live long—has not increased. We probably do not have proportionately more centenarians than in the early years. What has happened has been to make a long life possible for a greater number of people. The wanton extinction of hordes of babies and of young people before they had more than tasted of life has been stopped to a marked degree. What this has meant for the happiness and prosperity of the American people can scarcely be estimated.

Death is the great disintegrating force when it hits the family, especially the father. The effect of this tragedy on the family is tremendous, throwing every activity of normal life out of gear. The death of the young father ushers in a whole series of calamities

which tax every resource of the community. Only a comparatively short time ago the welfare agencies were largely concerned with the consequences following upon the premature death of parents. Tuberculosis was one of the major causes leading to the necessity for charitable relief. Only fifteen years ago, the death rate of young married men in New York State was nearly three times as high as it is now. Very much the same situation existed with reference to young and middle-aged married women. Under present conditions, the mortality rate has been so far reduced during the first ten or fifteen years of married life as to become a relatively minor factor in the disruption of families.

The break-up of families through divorce, on the other hand, has become increasingly more frequent with the passing years. In 1925 there occurred more than 175,000 divorces in the United States. This is at a rate of 1.5 per 1,000 total population, or one divorce for each seven marriages in that year. The rate for 1925 was three times as high as in 1887, when divorce registration for the whole country began. The frequency of divorce is now a major problem in our social economy and the evil is rapidly getting out of hand. In certain social classes divorce has become the fashion. Few realize how serious the situation is because it is as yet largely concentrated among persons enjoying ample means. But, unfortunately, such tendencies always percolate into other economic levels. What is

the mode in one class one year is copied by another the next.

As might be expected, children are relatively rare in families broken by divorce. There were no children in 57 per cent of the cases, and there was an average of only one and eight-tenths children in those cases which reported any children. The divorce rate is highest in the Southwestern states, including Arkansas, Louisiana, Oklahoma and Texas. There were 6.5 divorces per 1,000 married persons in 1925. The lowest divorce rate was recorded in the Middle Atlantic States, which include New York, New Jersey and Pennsylvania, where 1.5 divorces were recorded per 1,000 married people. There is, however, uncertainty as to the value of these figures because of the ease with which individuals can obtain divorces in other states than those of their usual residence. In Nevada, for example, the divorce rate was 34.7 per 1,000 married people. This high figure obviously reflects the peculiar legal situation in that state.

VII

Brief as our treatment of American demography must be, we cannot entirely omit a reference to the occupational distribution of our people and a word or two on the salaries and wages earned by them. Ours is a nation of workers with a negligible proportion of drones. In spite of great national wealth, we have maintained the early tradition of respect for

those who work. According to the latest estimates, there are about 43,000,000 gainfully employed persons in the United States, who constitute 37 per cent of the total population. They are the income-producing members of 27,500,000 families. There is, therefore, an average of one and six-tenths wage-earners to each family. We should really add to this figure the more than 20,000,000 housewives who are engaged in equally useful work and the millions of children and young people who are at school. But these two groups are ruled out by the arbitrary definition of the word "gainfully" employed. There are, however, many mothers and adolescents in this period of unparalleled national prosperity who are engaged in gainful pursuits. Approximately 2,000,000 married women and about 2,750,000 children, seventeen years of age or younger, are engaged in gainful occupations. In the last decade there has been an encouraging decrease in the number of children employed in industry. The number of married women in industry, on the other hand, is steadily increasing except in agriculture and domestic service. How many widows there are in gainful employment we do not know, but they undoubtedly form a substantial group.

During the greater part of our national life, agricultural workers constituted the largest single group of gainfully employed persons. But in the last fifteen years they have been supplanted by those in manufacturing and mechanical pursuits. According to a recent computation, the 43,000,000 gainfully em-

ployed persons are divided among the main industrial classifications as follows: Manufacturing and mechanical pursuits, 12,820,000; agriculture, 10,500,000; trade, 4,600,000; clerical work, 3,820,000; domestic and personal service, 3,590,000; transportation, 3,280,000; professional service, 2,370,000; mining and quarrying, 1,150,000 and public service, 780,000.

A vital factor in family, as well as in national, well-being is the amount and purchasing value of the income derived from labor. This determines largely the peace and effectiveness of family life. It would be instructive if we could give the average earnings of workers in each of our occupational classes. But no reliable data are at hand. We can at best give only rough estimates for very large groups. The total national income from all sources in 1921, the latest year for which data are available, was approximately $84,500,000,000. This divided by the 25,000,000 families of that year gives an average of close to $3,400 per annum. This figure covers all classes of the community and includes incomes from all sources. More important is a consideration of the income in those families which are largely, if not entirely, dependent upon wages and salaries. In 1921 the total income derived from salaries and wages was $34,700,000,000. The figure for 1926 is probably 20 per cent higher, making a total of about $41,500,000,000 from this source. As there are approximately 33,000,000 workers whose chief or only source of income is derived from their labor, the average salary or wages

of these people is $1,260 a year. This figure must, however, be increased by 60 per cent to cover all members of the family gainfully employed, which makes a total family income of about $2,000 per year. In addition, a sum of approximately $300 may be added to the average to include income derived from interest, gifts, legacies and other sources. In other words, we may estimate that the average current income of such families is approximately $2,300 a year.

But this average for wage-earners and salaried families must be considered with some caution. Possibly 80 per cent of the families we are considering have less than the average figure per family and only 20 per cent have this amount or more. The latter group includes families of professional men, of officials, managers, and superintendents in various industries. A recent estimate of the earnings of physicians, for example, shows an average income of from $3,000 to $3,500 a year. Other professions show similar levels. Here, too, are included the families of men in the skilled building trades and in other skilled employments where wages are high. It is with the large number of families whose incomes are below the average with whom we are more particularly concerned. In this group should be included the families of laborers, and of semi-skilled workers on the railroads, in agriculture, in the building trades, in the mines and factories, as well as in domestic and personal service. These families live fairly close to the margin of subsistence. A case of continued illness, of serious un-

employment, or such a contingency as the death of the wage-earner will, in many instances, force such families to seek charitable relief. Fortunately, the high degree of industrial activity which we have enjoyed in recent years and the decreasing amount of ill-health have resulted in remarkable advances in economic well-being. The condition of the American people is now better than ever before in our history and is unquestionably the most favorable in the world.

VIII

The history we have tried to trace of our origin and growth has valuable implications for us to-day in our effort to cope successfully with important problems. The clearest fact in our national life is that at bottom we are a nation of foreigners. The constituent elements differ only according to the length of their American domicile. Our history has proven that peoples of various races, of diverse traditions, customs, religions and languages, can live together in peace and prosperity, and build up a nation of striking unity and solidarity of purpose, and that this can be accomplished within the space of a very few generations. Our apparently haphazard immigration, which might easily have produced insurmountable obstacles to national unity, has, luckily, resolved itself into an orderly pattern. A new physical type as well as a new spiritual concept of how different peoples can live and work together harmoniously has been evolved. The oppor-

tunities offered the newcomer have been wisely used. He has played fair and has given of his best. He has often personified the best American tradition, appreciating to the fullest the meaning of liberty, probably because he has only so recently acquired it. The events of the last century and a half, in spite of occasional lapses and backslidings, have demonstrated the validity of the aims which animated those who framed the Constitution and who conceived a nation serving the oppressed peoples of the world and offering them equal opportunities for self-development, irrespective of wealth, race, color or creed.

Our history likewise forecasts a bright future for our country. The wise development of our splendid natural resources and our increasing industrial efficiency should insure a generally high standard of living. In a land like ours there should be no poverty and its attendant evils. The further extension of the public-health program will bring better health and longer life, with increased production and efficiency. Wider educational opportunities with increasing leisure will give deeper meaning to our lives. There is a real opportunity in America to demonstrate to the older civilizations of the world the great possibilities inherent in the common man. It is clearly the lesson of our past that under a favorable environment, operating through democratic forms, a happy and creative people can be evolved. There is no need to breed a race of supermen.

CHAPTER IX

ON THE TRUE RATE OF NATURAL INCREASE[1]

THE present policy of restricting immigration into the United States lends a particular interest to inquiries into the powers of natural increase of our population. To the casual observer it may appear that the excess of our birth rate over our death rate gives us a measure, or at least an index, of this power of natural increase. If he finds that in 1920 there was an annual birth rate of 23.4 per 1,000 and a death rate of 12.4 per 1,000, he may feel that there is no occasion for solicitude in the face of a balance of 11.0 per 1,000, or 1.1 per cent, per annum, representing the "natural rate of increase" of the population.

As a matter of fact, this argument is misleading. Both birth rate and death rate are affected by the age distribution of the population. If there is present a relatively high proportion of persons between the ages of fifteen and forty-five, this will tend to give a high birth rate, because it is at these ages that reproduction takes place; and it will tend at the same time to give a low death rate, because at these ages mortality is at a low point.

[1] Based on two articles by Louis I. Dublin and Alfred J. Lotka, in the *Journal of the American Statistical Association*, 1925, p. 305; 1927, p. 154.

Now this is precisely the current state of affairs. In our white female population 47.5 per cent are of child-bearing age—that is, between the ages of fifteen and forty-five years. These women reproduce at the rate of 101 children per 1,000 women per annum, and thereby establish a birth rate of 23 per 1,000 *persons* per annum, figured on the population as a whole. We shall see presently that this high proportion of women at the child-bearing ages is, in a sense, an abnormal situation, an unnatural swelling of the ranks of the adult population.

II

It is true that for certain economic reasons this would be a desirable state of affairs, provided that the high proportion of persons in mid-life were guaranteed to continue. Persons at these ages do productive work, and the presence of a high proportion of them acts favorably on the general level of well-being of the whole community. But an examination of the reasons for this preponderance of persons in the productive period of life does not seem to give much support for optimism as to the continued prevalence of this state of affairs. For there are essentially two circumstances that have given us this relatively high proportion of persons in and about mid-life. First, immigration, which brings to us chiefly adults, and thus swells at once the numbers of the adult class of our population. This source of productive and repro-

ductive members of our commonwealth is to be henceforth greatly restricted, so that in time we must expect, on this count, a less marked preponderance of this age class in the population.

The second source of our high adult population is not quite so obvious. Through past decades the birth rate has been falling. This means that persons thirty years old to-day are survivors out of a relatively larger batch of births, than persons ten years old, for example, who were born at a time of more recent and therefore lower birth rate. In this way the older age groups are to-day weighted with the fruits of a relatively higher birth rate in the more remote past. So long as the birth rate continues falling, this situation of a swollen age distribution at adult ages may not give any outward signs of its inherent weakness. But the birth rate cannot continue to fall indefinitely. Sooner or later it must become stationary, or nearly so. The second source of our relatively high proportion of persons in the reproductive age groups will then also be cut off, and then, with precisely the same mortality as to-day, and precisely the same fecundity of our women, we should have a birth rate very different from that now observed. That is to say, if the present schedule of frequency of maternity for women at each age remained permanently established, and if, similarly, the present schedule of mortality at different ages continued permanent, then, after the age distribution had had time to adjust itself to these constant biological conditions, we should have, instead of the present birth

rate of 23.4 per thousand per annum, a birth rate of only 20.9; at the same time the death rate would rise from the present (1920) figure, 12.4, to 15.4. Each of these changes alone is significant enough; but when we consider the effect of their combination upon the natural rate of increase—that is, upon the excess of the birth rate over the death rate—we find that this has changed from 11 per 1,000 per annum to 5.5 per 1,000 per annum; it has been cut down to just one-half!

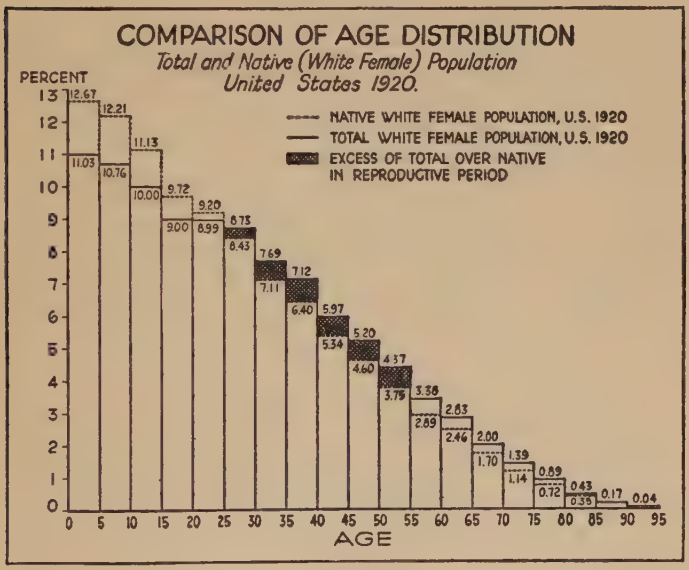
Another way to express these facts is as follows: At the present (1920) rate of increase, our population would double itself every 63 years. At the rate of increase actually corresponding to our rate of reproduction and mortality, the time of doubling of the population would be 120 years. This is not a very wide margin of safety on the right side of a purely stationary population.

Such is the situation in the broadest outlines. It is worth our while to take a somewhat closer view of some of the details. Those readers who find assistance in a graphic representation may profit by an inspection of the accompanying diagram, which shows, in the form of a sort of staircase, the proportion of women of various ages in the white female population of the United States in 1920. The dotted line refers to natives only, the fully drawn line to total, including native and immigrant populations.

It will be observed that under the age of twenty-five years the full line runs *below* the dotted line, indicat-

ing that here the total population shows a deficiency, as compared with the native population; there are actually fewer children and young persons, in proportion to the total population, than correspond to the purely native population. From age twenty-five up the situation is reversed. The full line appears above

CHART XIII



the dotted line—that is, the actual (total) population shows a relative excess at these higher ages, as compared with the native population. And, what is of particular importance for our present considerations, between the ages twenty-five and forty-five (where reproduction takes place most actively) the total popu-

lation shows a marked excess—emphasized in the drawing by the darkly shaded areas—over the native. It is clear, from this illustration, how immigration has helped to swell the ranks of just that portion of our female population on which our birth rate depends. The picture would be even more striking for the male population, since more men enter our country as immigrants than women. For the purposes of a statistical analysis it has been found more convenient to center our attention on the female population, as the period of reproduction and various factors connected therewith are more sharply defined for the female sex. But irrespective of this, the diagram clearly exhibits the influence of immigration on the proportion of persons in the reproductive period of life, and hence on the birth rate.

III

The effect of the *past* continued *decline* of the birth rate, in causing a *present* birth rate *above* the norm, is less easy to demonstrate in a graph or even to check up numerically by any simple arithmetic. For, statistics of births in the United States are a comparatively new departure. The first systematic report was made in 1915, and not until about 1917 were official reports in any great degree reliable and representative of the country as a whole. We are, therefore, thrown back upon indirect methods of convincing ourselves

that the present relatively high birth rate and the rate of increase are indeed ascribable in large part to the aftermath of high birth rates in the past. We must adopt the tactics of Mohammed, who obligingly went to the mountain when the mountain refused, at his bidding to come toward him. If we cannot deduce the present state of affairs, and show it to emerge, as a consequence, from the past, we *can* invert the process and deduce past birth rates from the present age distribution of our native white population. Through our knowledge of the proportion of persons born, who survive to any particular age, we can indirectly form an estimate of the number of births, in past years, from which the existing native population has sprung; that is, we can estimate, at least approximately, the birth rate in the United States in past decades. As is clearly shown in the accompanying diagram, the figures so obtained constitute a series resembling closely the course of the birth rate in England and Wales, where actual statistics have been available for many years past, and very accurately since 1872. This close resemblance of the retrospective estimate of our own birth rates to those of England and Wales gives color, and a high degree of plausibility, to our explanation of the present high concentration of the population within the reproductive age groups, as being due to the higher birth rates in past decades. The actual computation shows, for example, for the year 1872, a birth rate of about 37 per 1,000 in the United States, as against a

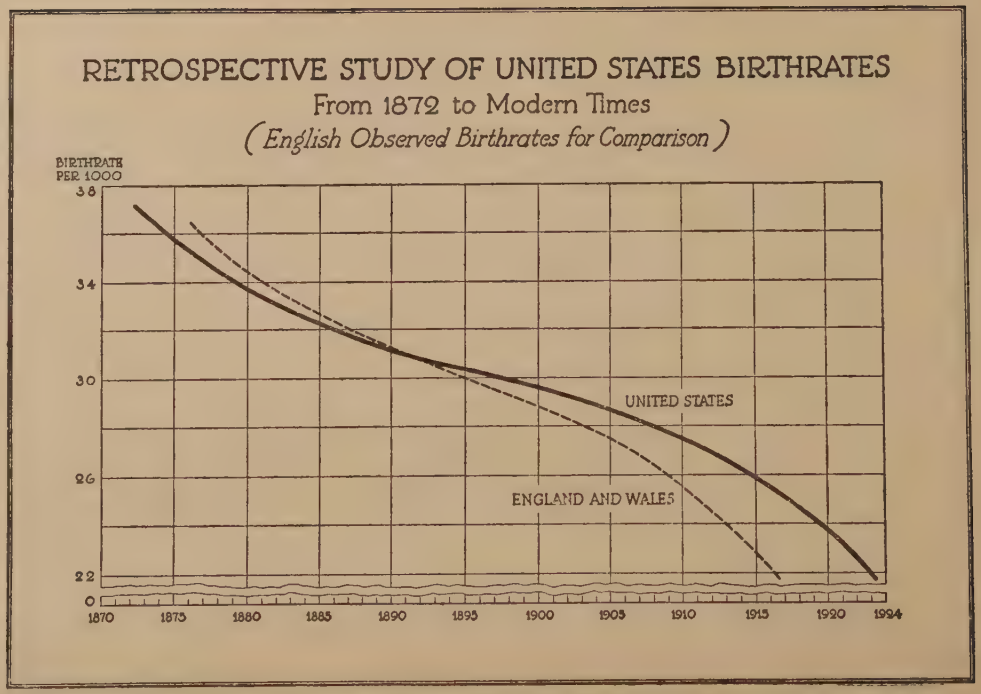

RETROSPECTIVE STUDY OF UNITED STATES BIRTHRATES
From 1872 to Modern Times
(English Observed Birthrates for Comparison)
BIRTHRATE PER 1000
38
34
30
26
22
0
UNITED STATES
ENGLAND AND WALES
1870
1875
1880
1885
1890
1895
1900
1905
1910
1915
1920
1924

CHART XIV

birth rate of about 36 per 1,000 in England and Wales, and a birth rate of about 23 in modern times.

It has thus been made clear, by our reconstruction of the past birth rates in the United States (of which we have no direct record), that the circumstances referred to above, as causing a swelling in the ranks of our mid-life population, do indeed exist. For many years past, and surely as far back as 1870, our birth rate has been steadily declining. The result is that persons thirty years old to-day, for example, are the survivors out of a relatively larger batch of births than persons ten years old who were born at a time of more recent, and therefore lower, birth rate.

IV

Now the following question arises: If the present appearance is deceptive, if our birth register is bolstered up with entries which we must credit, as it were, indirectly, to the generation that went before us, how, then, can we form a correct estimate of the true reproductive activity of our own generation on its own merits? One might go a step further and ask, is it possible to do this at all?

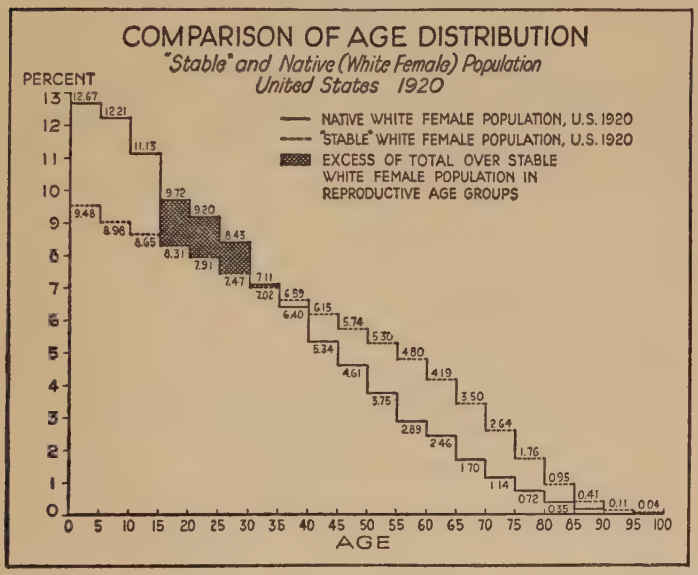
There is a technique by which the true answer can be found for the question: How fast are we increasing, on the basis of present performance alone, apart from the influence of past immigration and past birth rates? The Census Bureau has published tables showing the number of children born per annum of women

of a given age. This may be regarded as a fundamental characteristic of our population as it stands to-day. Statistics also give us the proportion of women at every age of life who are living in the married state. And lastly, statistics of deaths enable us to construct a so-called life table which shows how many persons survive to age one, two, three, five, ten, etc., out of a cohort of 100,000, say, picked out for observation at the moment of their birth. Now all these three sets of fundamental characteristics can exist *for a time* with a wholly irregular, arbitrary, or "unnatural" age distribution, such as that prevailing among us to-day. But this is only for a time. If the population were left to itself, and it continued to marry, to reproduce, and to die according to the schedule of to-day, then presently the irregularities and unnatural humps in our existing age distribution would become ironed out, and a certain perfectly definite distribution, corresponding precisely to our present-day biological characteristics, would become established. This "normal" age distribution the statistician can calculate, just as the engineer can calculate the dimensions of a bridge from the specifications of the load it is to carry. And the same calculation by which the normal age distribution is found then yields us the true rate of natural increase—that is, the rate which permanently corresponds to our present biological characteristics as to frequency of marriage, reproduction, and death.

The results of this computation are exhibited in the following diagram. This is similar in character to

the first of the drawings in this chapter, but presents a comparison, this time, between the actual native white female population of the United States, and the *normal* white female population which corresponds to our present biological characteristics as regards fer-

CHART XV


COMPARISON OF AGE DISTRIBUTION
"Stable" and Native (White Female) Population
United States 1920
PERCENT
NATIVE WHITE FEMALE POPULATION, U.S. 1920
"STABLE" WHITE FEMALE POPULATION, U.S. 1920
EXCESS OF TOTAL OVER STABLE WHITE FEMALE POPULATION IN REPRODUCTIVE AGE GROUPS
AGE

COMPARISON OF NATIVE WHITE FEMALE POPULATION UNITED STATES 1920 WITH POPULATION IN STABLE AGE DISTRIBUTION SHADED AREAS REPRESENT EXCESS OF NATIVE OBSERVED OVER "STABLE" POPULATION IN REPRODUCTIVE AGE GROUPS.

tility and mortality. Again, it is clearly apparent, from the darkly shaded portions of the diagram, that in the age groups between fifteen and thirty-five years —that is, the actively reproductive age groups—there is a marked excess in the native population over that

normally corresponding to our innate biological character. We have here a graphic showing of the effect of past high birth rates in raising our native population in mid-life above its normal figure. This point is so important that it may be well to state it also in another form. If our present biological characteristics of fertility and mortality were, so to speak, set solid and unchangeable for years to come, and immigration and emigration were completely stopped, the existing age distribution would become modified, and, gradually, as the years went by, would settle down to the "stable" or *normal* form shown by dashed lines in the drawing. The proportion of white females between the ages of fifteen and thirty-five would, in the course of this readjustment, diminish from the present (1920) figure of 34.5 per cent to the ultimate figure of 30.7 per cent.

Once the normal age distribution has been determined, it is a relatively simple matter to compute the corresponding birth rate and death rate. The results of this computation are astonishing. As we have already said, only about one-half of the present rate of natural increase actually results from our fundamental biological characteristics. The other half is a mere transitory effect, due to the surcharging, for the time being, of our population in mid-life. To speak in actual figures, the annual birth rate in 1920 was 23 per 1,000, the death rate 12 per 1,000, the rate of natural increase accordingly 11 per 1,000. But the ultimate rate of increase, when the present hump at mid-life in

our age distribution has become smoothed out, will be only 5½ per 1,000 per annum. Such a narrow margin of safety as this might very easily be wiped out by relatively slight changes in our rate of reproduction. To tamper with this (if such a thing is possible) is, therefore, to undertake a responsibility of the most serious character, a responsibility which no thoughtful person would want to shoulder without having first made himself thoroughly familiar with all the circumstances bearing on the matter. He must know, before he discusses limitation of families, what size family is actually needed merely to keep the number of the population from going downhill. And he must acquaint himself with the comparison of this number and that which would actually correspond to our present reproductive habits. Yet hardly any of the numerous persons who have given the world their views on birth control and related matters have made any attempt to gauge these important figures.

V

As to the size of the family required to keep the population stationary, this is found readily enough. From the life table and statistics of marriage it is easily computed that 21.5 per cent of all women born would die without marrying, according to present (1920) conditions. Thus, out of 1,000 born, 215 would die single, and 785 would marry. But about one-sixth of all marriages remain sterile. Therefore,

of the 785 women that marry, only 654 actually become mothers. If the population is to remain stationary, these 654 must, by reproduction, replace the original 1,000; that is to say, 654 mothers must have 1,000 daughters, or, on an average, each mother must have 1.53 daughters. Now, for every 100 girls there are 106 boys born. Hence, finally, in order just to maintain the population on an even keel, according to present (1920) conditions, there must be born, on an average, 3.15 children per mother. This, then, is the average size of family which *at a minimum* we must maintain if the population is to be preserved from a slow self-effacement. We may even do a little better than this, and manage with a smaller margin, if further improvements continue to be made in our death rates. But here it is well to sound a warning. Twenty or thirty years ago our present rate of reproduction would have been barely sufficient to maintain the American population at a standstill. Actual computation shows that the mortality rates of 1901, combined with the rates of reproduction of 1920, would have netted a natural rate of increase of less than one-fifth of 1 per cent—we may almost say none. It is only the improvements which have taken place in the general hygienic conditions that enable us to carry on at all with the present rate of reproduction. And, in the last few years, mortality in the United States, as reflected in the annual life tables constructed by the Statistical Bureau of the Metropolitan Life Insurance Company, has shown at best only very slight progress.

This is not necessarily a cause of great concern, for sooner or later a stage must be reached when further advance becomes difficult. It is a matter of common experience that in every endeavor the last few notches toward the top are hardest to gain. The economist is familiar with this principle, which he calls the law of diminishing returns. The same holds true in every field of human effort. A point is reached where conditions become essentially stabilized, and every gain is bought at a higher cost. We may, indeed, be hopeful of ultimate further advances, especially in conquering some of the outstanding scourges of mankind. But spectacular immediate gains can hardly be expected. Until we actually have a more favorable showing it will therefore be wise to continue to look upon our figure—3.15 children per mother—as the absolute minimum compatible with continuance of our present numbers.

And how does this figure for the number of children per mother compare with that resulting from the actual conditions of fertility and mortality as recorded, for example, in the last census year, 1920? How much margin have we to spare, in the average size of American families, over the absolute minimum required to maintain us on an even level?

This question also can be answered by a simple computation. It is found that the existing conditions correspond to an average family of 3.7 children per mother—that is, 0.55 in excess of the minimum. On an average, then, for every two families, there is about

one child born in excess of the absolute minimum required to maintain the population equilibrium. This is not a very liberal margin, especially in view of the modern tendency toward shrinking families. It is interesting to compare the conditions to-day, in this respect, with American families in the Colonial days. According to a statistical study of genealogical records conducted by Frederick S. Crum, prior to 1700 the average number of children per wife in America was 7.4, or almost exactly double the figure given above as corresponding to present day conditions. As a matter of fact, Crum's estimate, being based on a select sample (for the majority of people have no recorded genealogy reaching back to an early date), probably errs on the conservative side. An estimate based on computations made by us places the figure at 8 children per mother for the year 1790. This corresponds to a birth rate of about 50 per 1,000 per annum. With a death rate in the neighborhood of 22 per 1,000, the net increase per annum was nearly 30 per 1,000, or 3 per cent.

VI

It requires no skill in statistical method to recognize the simple fact that, other things equal, the rate of increase of the population is greater, the larger the average family. But it is not so easy a matter to determine the precise relation between size of family and rate of increase of the population. In fact, the

computation is rather involved and will hardly interest the general reader. The result, however, is easily stated and as easily comprehended. An average of two children born, per family, would result in a steady decrease of the population at such a rate that it would be reduced to one-half its present number in 43 years, to one-quarter in 86 years, one-eighth in 172 years, and so on. Three children would still give a very slight decrease, so that the population would become halved in 380 years. Four children would lead to a doubling of the population every 82 years, five children a doubling every 43 years, and six children, every 30 years. These figures are all based on the mortality of 1920, and on the supposition that the frequency of child birth as observed in 1920 is increased or decreased, in equal proportion at all ages of the mothers, by just the needed ratio to give the stated average number of children per family.

The rate of increase of the population depends not only on the actual number of children per family, but also on how far apart generations are spaced. It is interesting to inquire what would be the effect of a spreading further apart of generations, such as would result from a postponement of marriage. Under existing conditions the mean length of a generation, reckoned from mother to daughter, is twenty-eight and one-half years. (Reckoned from father to son, the length of a generation is about five years more, on account of the later marriage of men, as compared with women.) It can be shown that, other things

remaining the same, for every year that is added to the distance between generations (from mother to daughter), the average number of children per mother is reduced by .32 of a child. This agrees closely with the estimate made by Dunlop on the basis of Scotch statistics, that one year's delay of marriage results in a decrease of the average family by one-third of a child.

VII

Many persons suppose that vital statistics is a dry subject and that the statistician is a man who tries to express everything, in season and out of season, in figures, losing sight of the human element behind his collection of alleged facts. This is altogether a misconception. True it is that the world's events take place in accordance with mathematical law; and he whose mind is built that way does not rest satisfied until he can discern at least the outline of the exact numerical laws which thus govern all history. But even to the layman the quantitative facts have a live interest, if only they are presented to him freed from incumbering technicalities. We started out, in this little excursion into the field of vital statistics, with our attention fixed primarily on the natural rate of increase of our American population—that is, the excess of the annual births over the annual deaths. We noted that, after correcting for the purely incidental feature of a peculiar temporary age distribution, our

natural rate of increase was reduced to one-half of its crude figure. We find ourselves, therefore, with a rather narrow margin of safety dividing us from the downhill slopes of actual population decrease. With immigration greatly reduced by recent legislation this conclusion has obviously a serious aspect. But the study of our main question led us into a number of interesting bypaths. We found that just over 3 children per mother is the size of the average family required to keep the population just stationary; that present conditions of reproduction correspond to 3.7 children per mother; and that in the early days of the eighteenth century the average family was just about twice this, while the death rate in those days must have been over two times the present death rate. These, and other facts which it is not necessary to recapitulate, are certainly matters of great human interest, which, let us hope, is not lessened by their presentation in numerical form.

CHAPTER X

BIRTH CONTROL AND THE POPULATION QUESTION [1]

THERE has never been a time when the problem of population has received more attention than now. It is on everyone's tongue. In one phase or another, it is constantly the subject for discussion among individuals, for legislative consideration by Congress, and even for international interchange and agreement between nations. Largely in response to this increasing popular interest, a succession of scholarly and stimulating books on population have recently followed one another in England and the United States, all of them urging upon intelligent people the necessity for constructive thinking on a population program.

It is not difficult to explain the current vogue. The Great War itself was, in a sense, an expression of the population problem as it confronted the nations of Europe eleven years ago. The crowding of the peoples of Germany and Austria was undoubtedly one of the underlying causes of the war. Each country believed it needed more room for expansion, and desired addi-

[1] An address presented to the Sixth International Neo-Malthusian and Birth-Control Congress, New York City, March 26, 1925, and printed in the *Atlantic Monthly*, February, 1926.

tional markets and colonies where its surplus people could be accommodated and food raised for the use of the homeland. During the war, and in the succeeding years, a flood of nationalist feeling was unloosed in each belligerent country, stimulated by a type of population propaganda which glorifies one's own people, but always at the expense of the enemy and even of the neutrals. Even at this time the population problem transcends all others; but the consideration it is receiving is not particularly sound or conducive to the happiness or prosperity of the nations or the peace of the world.

II

In our own country, intense nationalist feeling has fairly run away with us and has been particularly misdirected. It has expressed itself primarily in two movements: first, the Ku Klux Klan; second, the new immigration policy. Both appeal to a great number of native Americans in all parts of the country and may be summed up in the slogan, "America for Americans." What underlies these phenomena is, first of all, a distrust of the newcomer, resentment at his success, and the fear engendered by his greater fertility and rapid increase in numbers after his arrival. The adherents of the Klan see themselves losing control of the country. Their formation of an organized group, then, is really the expression of a defense reaction to the passing away of power from their hands and its

concentration in those of aliens whom they consider inferior, or, in any case, unable to conduct properly the affairs of the country. Essentially the same reasoning is at the bottom of the new immigration law, which admits into the country only a limited number of aliens selected from the few countries whose peoples and standards of life most closely resemble our own. The stream of papers and books in recent years which has centered around and supported the Nordic myth is simply an effort to give the appearance of science to what is fundamentally an expression of unreasoned prejudice.

Such sentiments and passions, however, may be allowed to run their course. They will soon give way to better judgment. The extravagances of the Ku Klux Klan propaganda have already abated, and we are probably through with the worst phases of this queer phenomenon. The immigration restrictions, on the other hand, are of a different nature. These appear to have been based upon a scientific assumption—namely, that the country was rapidly reaching the saturation point. More than one writer has been sounding an alarm that America is rapidly becoming overpopulated and that, if we are to maintain our high standards of living and avoid the troubles of the rest of the world, we must keep our population down. They have been fearful lest the future growth of the country keep pace with the increase of past decades and tax our natural resources to the limit. They have, therefore, urged the most drastic limitation of immigration and

have encouraged even a further restriction of our own fecundity. Such an assumption must be subjected to examination and criticism.

The fact upon which these fears are grounded is that we are increasing at the rate of a little over one per cent a year. Our birth rates are still running as high as twenty-three per thousand per annum and our death rates only about twelve, leaving a natural increase of eleven per thousand. If this rate were continued without let-up, our population would double in about sixty years even without any further additions from immigration. A population of more than two hundred millions by 1980 is too much, and all the horrors of overcrowding, of lower living-standards, and even of war with our neighbors, are conjured up to warn us against this horrible adventure. Careful study has convinced me, however, that there is really very little justification for this point of view. In spite of the crude figures of increase in recent decades, the American population has not been running wild, nor even approximately approaching the limit of its resources. We are to-day supporting only ninety persons per productive square mile of land, as against two hundred for France. If the density of the latter country per productive square mile prevailed in the United States, the population would be 250,000,000. Yet France gives no impression of overpopulation. She is very well able to take care of herself, to supply her necessities of life, and even to export large quantities of goods to the outside world. To-day France

has no unemployment problem and has, in fact, welcomed several million workers, especially from Italy and Poland, to her fields and factories. With our superior soil and incomparably richer natural resources in forests, coal, oil, and other minerals, we are as yet nowhere near the situation in which the quantity of our population need give us concern. The quality of our population is another question, and to that I shall refer later.

But I should point out that there is little, if any, immediate danger of our increasing our population to the density of that of France or of the other Western European countries. The time of rapid multiplication of our population has been left behind for good. Professor Wilcox of Cornell University, from a critical analysis of American population statistics, infers that a natural decline in the native American birth rate began as early as 1810 and that it has continued since that time. The decrease has been much more pronounced in recent decades. But this has received very little attention because its effects have been covered up, partly by an improvement in mortality and partly by the increases resulting from recent immigration. The increase in our numbers in the last half-century has been due in a large measure to immigration and to the results of immigration. In 1920, the foreign whites and their native offspring constituted 34.4 per cent of the population. Since 1900, over sixteen million foreigners have entered the country. These people are of fertile stock, accustomed for centuries

to large families. They arrived here during their reproductive years, and they produced large numbers of offspring soon after their arrival. It is this which has given the appearance of rapid and healthy increase to our population figures, but few have analyzed them to their source or have attempted to understand the implications which are involved in them.

III

To-day the picture is on the way to being completely changed. The recent restrictions on immigration will take good care that our future increase of population, if there is one, shall not come from that alien source. More and more it will depend upon the excess of births over deaths in the native population. If present indications are any guide, the phenomenal growth of the past will never again be repeated. Already in 1920 the native stock residing in the urban areas was scarcely reproducing itself. The birth rate of native Americans in our cities is among the lowest in the world. There are also clear indications that among the foreign stock the families become smaller in successive generations reared in the United States. With immigration restricted, and with the spread of American ideas and standards of life among the newcomers and their children, the birth rate will decline to new minima. Professors Baker and Ross, investigating this subject among middle-class families of the present generation in the Middle West, found a shrinkage

in family size from 5.4 to 3.3 children in the course of one generation. This is equivalent to a drop of 38 per cent in the number of offspring in the space of only a relatively few years. Others have found exactly the same situation in other localities. The tendency toward small families has apparently become a fixed habit among the American people. Every population forecast that I know must, therefore, be revised with due regard to the declining fecundity of stocks now composing the American population. We must be prepared at a comparatively early date for a stationary population unless we completely change our present attitude toward the foreigner and his further entry into the country, and modify our approval of small families. Such a reversal is not likely to take place, because restriction in the number of children apparently offers many personal advantages and appeals to the average family, which is much more concerned with the immediate increase of its comfort than with abstract principles of obligation to country or to mankind in general.

It will clarify our discussion at this point if we consider the number of births that it requires, under present conditions of mortality, to keep our population stationary. According to the mortality and marital conditions prevailing in 1920, out of every 1,000 females born only 788 will eventually marry. In other words, we must count on 788 married women to give birth to a thousand daughters in order to replace the thousand from which they sprang. To put it another way,

1,000 married women must have 1,268 daughters to replace themselves and their unmarried sisters under present mortality conditions. Likewise, it can be shown that a thousand married men must be the fathers of 1,350 sons in order to replace themselves. Combining our figures we find that 1,000 families, on the average, must have 2,618 children, which means that each family must, on the average, during the reproductive period, produce 2.6 children to replace the original quota from which the parents sprang. Not all families have children, however; for, at the present time, about one marriage in six is either sterile or does not lead to live issue. The burden of child-bearing, therefore, falls on the remaining wives, who must bring into the world an average of not 2.6, but 3.1 children. The family unit must, therefore, average 5.1 persons (including all the children born to fertile mothers, not merely the children living at any given moment). All groups of urban American families recently studied have shown that the average number of children born to a completed marriage is barely sufficient to maintain a stationary population. Only when the rural areas of the country are included do the figures show a substantial natural increase.

But even more disturbing is the fact that the rate of natural increase which we now have—namely, 11 per 1,000 per annum—is in the very nature of the case spurious and entirely temporary as an index of our true rate of growth. Our current methods of computing birth rates, death rates, and rates of natural

increase on gross population are faulty and lead to grave error. Obviously such rates depend upon the character of the age distribution, and this is a shifting base. Dr. Lotka, the distinguished mathematician, and I have recently made an excursion into this field and have uncovered a number of highly interesting and even surprising situations. As the result of the higher birth rates of past generations there is at the present time an abnormally large number of persons at the reproductive ages of life, and this tends to increase the current birth rate. We have calculated what the present birth rate would be if the age distribution at the reproductive ages were the result of a prolonged continuation of our present rate of procreation. The effect would be to reduce the figure from 23.4 per 1,000, the present figure, to 20.9. In other words, what for the time being maintains our birth rate is not our inherently high reproductive vitality, but rather the fact that the surviving descendants of a more highly reproductive generation are to-day swelling the ranks of middle life and participating in parenthood. They thus lend a spurious appearance of vigorous growth to an otherwise meagerly reproducing population. At the same time a second result of this padding is to reduce the death rate disproportionately, because the ages of early adult life have very low mortality rates. If the correction were made for an age distribution on the basis of the present life table and the present rate of procreation, the death rate, instead of being 12.4, as it is now, would become 15.4. The effect of these

two corrections would be to reduce the rate of natural increase from 11 per 1,000 to only 5.5 per 1,000 per annum—that is, to reduce it to one-half of its present value. This means that, aside from the transitory benefits of past high birth rates which for a while we are still enjoying, we are actually increasing at the rate of only 5.5 per 1,000 per annum, instead of at a rate of 11 per 1,000 per annum.[1]

Equally interesting is the result of our investigation into the effect of the recent improvement in mortality. The last five or ten years have seen a marked diminution in mortality rates, which has had the effect of augmenting the rate of natural increase. If we should calculate the rate of natural increase of our population at our present rate of procreation and at the mortality rate of 1910, the result would be a rate of natural increase of only 3.6 per 1,000 per annum; and if we should go back to the mortality conditions of 1901 the present rate of procreation would barely keep us from the down-grade. The rate of natural increase would then be reduced virtually to zero. We should then have a condition of a stationary population. These figures bring home clearly how close to the danger line we are now going.

We must exercise particular care, as we approach the point of a stationary population, not to weaken its internal composition by increasing the proportion of defective and dependent stock. This is all the more important because a stationary population inevitably contains a relatively greater number of older persons

[1] See Chapter IX, p. 194.

than a growing population. The support of these more advanced age groups falls in part upon the young people, who must, therefore, face the prospect, in coming years, of carrying a greater burden than has fallen to their share in the past. The proportion of persons sixty-five years of age and over has been increasing in recent decades and is still going on. In 1900, persons at these ages constituted 4 per cent of the total population; in 1920, the proportion was 4.6. When the age distribution of our population settles down to that compatible with our existing powers of reproduction and of survival, the proportion of such older persons will then be 9.4 per cent. If in the course of time the population is reduced to a stationary state, the proportion of persons over sixty-five years of age will be 10.5 per cent. We are thus confronted with a vicious circle; for the greater the burden placed on young people, the fewer will be their children, and this will mean still fewer young people at the reproductive period in the next generation. If a population can increase in a geometric ratio, it can also decrease in the same ratio. This is the real danger.

IV

In the light of this situation, we can see how misdirected at this time is the propaganda for birth control which is so active all over the country. Its advocates seem altogether to have missed the true state of affairs in our national economy. They have certainly

erred in their assumption of a too rapid increase in our numbers and of a crowding on our natural resources. I am confident that they have based their recommendations on an emotional reaction and not on a careful scientific analysis of the facts. They have observed that there are poverty-stricken and diseased people, especially among unadjusted immigrants, whose families are far too large for their own good or for the good of the community in which they live. They have generalized on such observations, forgetting, apparently, that only a very small fraction of our people are in such wretched condition and that the great mass are normal, self-respecting folk who do not assume obligations beyond their ability to carry them out effectively. Nor do they appear to realize that even now the practice of contraception is very widespread. There is no other reasonable way to explain the rapid decline in the birth rate in recent decades. Accurate figures are not at hand, but the most reliable indicate that the drop has been one-third in about twenty years. Yet certain persons seem to look upon birth control as a new force which need only be generally applied to solve most of our present-day troubles. They forget that in one form or another birth control has been practiced for a long time and has had an increasing vogue in all civilized countries—and, what makes it most unfortunate, especially among those who need it least. The studies of Katharine B. Davis, Professor Cattell, and others demonstrate this fully. The reduction of

the number of children through contraception is an established practice among city dwellers belonging to the salaried class and among those who are economically best off. Such activity is distinctly antisocial, for it enables selfish people to escape their responsibility, ultimately to their own detriment and to the injury of the state.

One would think, from reading the literature of the Birth Control League, that the matter of parenthood was entirely an individual affair. As one gentleman recently put it: "I suit myself with regard to the number of my children. I owe the state nothing." This attitude is obviously shortsighted and indefensible. It serves, however, to focus attention on the conflict between the immediate interests of the individual and the more permanent interests of the state. The average man or woman generally determines his or her personal conduct without much consideration for the good of the community. It is often pleasanter and always easier to keep the number of our dependents down to a minimum. But the logical consequence of such an attitude is nothing short of a challenge to the permanence of the state, and this is generally recognized. Society seeks to protect itself against such a contingency by expressing general disapproval of celibacy and proscribing the dissemination of birth-control practices. On the other hand, it recognizes the dignity of parenthood and, as a crudely constructive measure, it has recently begun to take into consideration the number of children in the family as an item in

fixing the amount of taxes. This is but an initial step that the state must later extend to make more attractive to its people the obligation of parenthood. The state must insist on its perpetuation, and cannot condone or argue its own suicide. We may express our freedom as individuals only within the limitation that the continued existence of the state is assured.

The real trouble with the birth-control propagandists is that their solution is altogether too simple. They have made the snap judgment that our present population contains too many people. Certainly they have not made a sound population analysis that would attempt to relate our present population structure to the natural resources of the country and to the efficiency with which we utilize our resources. These are highly technical matters that cannot be decided out of hand, not even by generous and high-minded people. The problem is, in fact, one of the most complex which confronts the social scientist. Variety of opinion still prevails among serious students on virtually every aspect of the population question. There can, therefore, be no ready panacea. But, if there is no consensus of opinion on details, there is at least general agreement that the population problem can be attacked only through long and intensive study of our present composition, with due regard to the natural resources of the country, to our future immigration policy, to the organization of industry, the improvement of our channels of distribution, the training and direction of our labor supply, and a host of other factors which will

determine the limits of our future population. How different is the attitude of the advocates of birth control, who, without any hesitation, have ascribed most of our social and economic troubles to overpopulation and have proceeded forthwith to remedy them by striking at the very root of our national life.

It is to be observed, by the way, that the birth-control propaganda has proceeded without much effort to prove the efficacy and the safety of the measures that have been urged on the public. The best medical opinion is still very uncertain as to the procedures recommended. The activity of the birth-control clinics has as yet resulted in very little data of a trustworthy character. Those who have studied the work of the birth-control clinics abroad have been unable to discover definitely approved methods in general use. But more vital is the question of safety. Are contraceptive practices, in fact, without hazard to those who indulge in them? Gynecologists and obstetricians of the highest standing have been very suspicious of some of the devices in use and have traced serious affections back to them. There is also the very strong possibility that such practices result in permanent sterility of young married women. I know nothing so tragic as the case of young people who avoid children in the first years of their married life only to find later that they cannot have them when they want them. The number of childless marriages is rapidly increasing to the point of becoming a prime social problem. Contraceptive practices among young people may have a

good deal to do with it. And what is the usual effect on the spiritual life of those who, through continued control, keep their families down to a miserly minimum? This is probably the most serious single consequence of the current fashion: that it robs those who indulge in it of the greatest of all blessings and the source of deepest inspiration—namely, a family to provide for and to live for. They sacrifice their birthright, the greatest influence in character development, for what usually turns out to be a mess of pottage.

Those who engage in this propaganda should be urged to follow a more constructive program. One should expect from such people a well-balanced theory of parenthood. Instead of limiting themselves entirely to arousing sympathy for those who have suffered from overlarge families, they should take up the other side of the picture and help to arouse public sentiment in favor of fairly good-sized families among the rank and file of normal people. They should help to set the fashion, not for large families—the day for that is over—but for families of at least three children and as many more as can be readily and effectively taken care of.

The organization that is now, in my judgment, doing much harm can shift its emphasis from the dissemination of propaganda to the propagation of scientific research; and it would thereby greatly increase its usefulness. We need to-day more light on the problem of population. An organization dedicated to this subject could do no better than to encourage study and

investigation of the various aspects of the problem in the spirit of science. Only through this means will a sound population policy be developed.

V

Probably nothing that we can do will alter the tendency among the great mass of Americans to reduce the size of their families. Reproduction will, hereafter, be more and more determined by intelligence and restraint. Excessive breeding should receive scant approval anywhere. We must not aim, at this time, for numbers at the expense of quality, but rather seek to develop a well-organized and happy society. That is the objective which should animate every student of population, every statesman, and every thoughtful citizen. We must be careful, however, about the way we take to arrive at this goal. Merely wiping out our natural increase by the first means at hand will not do it. We must not substitute real and serious troubles of a new sort for minor and even imaginary old ones. We must not, above all, forget that population mistakes are not easily remedied; that when they are once made, and their effects have become visible, it is usually too late to correct them.

Thus far we have considered the quantitative aspect of the population problem. When we turn to the qualitative side of the question, there are just as many misconceptions rife in our current thinking. It has been fashionable in recent years to lament the non-

fertility of the native stock and the fecundity of the newcomer. It has been assumed that those who arrived here earlier, and especially those of Nordic origin, are innately superior. A warning should be sounded against too ready acceptance of a theory that establishes sharp class distinctions without sufficient scientific proof. Evidence is hardly sufficient at the present time to warrant the sweeping conclusion that certain racial elements in our national life are vastly superior to others.

Reflecting very much the same artistocratic bias is the current view, especially pronounced among certain biological writers on population, that the country is headed for disaster because of the greater fertility of the "masses" as contrasted with that of the "classes." The literature associated with the eugenic movement has overstressed the dangers implied in the differential birth rate. "Beware of reproducing from mediocrity," is the warning. There is often a thinly disguised plea for a race of supermen who, presumably, could spring only from the upper social and economic strata. The common man has little place in this scheme of things, although he does, after all, make up the bulk of the population.

This basic assumption should be thoroughly tested, even though its acceptance does flatter our self-esteem and reflect the paganism of our times. I seriously question its validity and consider this attitude a very crude and unjustified application of biological jargon to human life. Its chief defect lies in its almost total disre-

gard of the influence of environment and tradition on our conduct and achievement. It is, moreover, a direct challenge to our best ideals of democracy and religion. When we have eliminated the upper and the lower 10 per cent of our population, there is not sufficient indication of serious differences in innate ability among the remaining 80 per cent to justify the current fears and warnings against their deliberate participation in parenthood. They are neither spectacularly able nor do they abound in defects. If they lack the brilliance that would single them out for special distinction, they have usually other compensating, valuable, and attractive qualities. They are just plain folk carrying on the world's work. We see on all sides clear evidence of the ability of ordinary people to give birth to children capable of the highest achievements, as opportunity and environment release their power. Our social organization, by its very complexities and the perfection of its mechanical foundations, is conducive to stimulating in men from all walks of life the innate abilities that in a less well-organized society might go to waste. Throughout all ages, the leaders of mankind have come predominantly from homes that at first sight seemed most unpromising and commonplace. Will not the leadership of the next generation come, as it always has in the past, from that source?

For these reasons I consider some of the newer tendencies in the development of the American population far from inimical to our institutions and to the best traditions of the country. The rather free fertility

still prevailing among those who have recently arrived is not to be deplored. If we can be careful to control —or, better yet, entirely check—the reproduction of the unfit, we are in no danger of racial deterioration. There has always been a differential birth rate, and a replacement of one group of people above by another equally good from below. In all ages men have raised themselves above their inherited station in life and have occupied the seats of the mighty left vacant by those considered their superiors, who have neglected or have been incapable of performing their highest obligation to society—namely, parenthood. We must in all fairness examine critically the current point of view and shift the emphasis in our population discussion from a glorification of the upper strata to a more generous recognition of the inherent worth of the great mass of mankind; and especially so if we, who consider ourselves superior, persist in celibacy or in virtual or approximate sterility.

CHAPTER XI

THE EDUCATION OF WOMEN FOR HOME-MAKING AND CAREERS[1]

IF A keen student of society of the eighteenth century, like Adam Smith, came back to live among us for a while, two things, I believe, would impress him more than anything else. The first would obviously be the great wealth of our mechanical equipment, the ten thousand external aids of our daily life. The automobile, the telephone and telegraph, steam locomotion, and the use of electricity for power have made us incomparably more comfortable and prosperous. The second thing he would observe would be the remarkable change in the status of women.

These two phenomena are very closely related. Both take their origin from the industrial revolution which was ushered in at the beginning of the nineteenth century. In this paper I shall discuss principally the second of these remarkable changes.

The changed status of women constitutes a major revolution in the history of the world. When Adam Smith lived women had their definite place, and that was the home. They did not vie with men in directing the external affairs of the world. Within the

[1] Printed in the *Atlantic Monthly*, September, 1926, page 335.

home there were activities enough; but beyond that it was a man's affair. With the development of invention and the consequent growth of industry, women in large numbers were called out of their homes to participate in the new life. It was found that their labor in many fields was as efficient as that of men and much cheaper. The simplification and standardization of the processes of production, moreover, have made possible the employment of increasingly large numbers of women in recent decades. In 1870, which is the first year for which census data are available, there were 1,800,000 women gainfully employed, of whom nearly 1,000,000 were engaged in domestic and personal service. In 1880 there were over 2,500,000; by 1900 the number had increased to more than 5,000,000; and in 1920 there were over 8,500,000 women gainfully employed. The number would have been even greater if the large number of employed married women were listed in their gainful occupations rather than as housewives. Every year now sees an increase in the number of gainfully employed women; in fact, the proportion is increasing faster than that of men.

In 1920 over 1,000,000 women were engaged in professional service in the United States. They were represented in virtually all of the major professions, including medicine, the law, science, and the arts. Teachers were the largest single group, with well over 600,000, followed by almost 150,000 trained nurses. Musicians and teachers of music were represented by 73,000; religious, charity, and welfare workers by

27,000; librarians by 13,000; physicians by 9,000; authors, editors and reporters by nearly 9,000. The list of professions in which women have established themselves would be a very long one. There are in addition several hundred thousand students in professional schools and colleges, many of whom are preparing themselves for professional careers. They are not included in our figure of a million.

The whole aspect of woman's life has been changed, and community life has been correspondingly transformed. A hundred years ago women had only one career to look forward to, and that was home-making; to-day the average American girl thinks of many other fields for her activities. Home-making as a career is being relegated, for the most part, in the minds of young people, to a secondary place. Even if most educated women still look forward to marriage as an ultimate goal, their first and immediate choice is very often along other lines.

II

The participation of an ever-increasing number of women in industry and in the professions has unquestionably made a great impress upon our social economy. These women are producers. They have added materially to the world's goods and to the general stock of ideas. To the women themselves this new activity is an expression of their inward power. I imagine most of them get great satisfaction out of the feeling

of equality and ability to compete with men in various fields. But, on the other hand, such activity on the part of women in the professions and in the world at large carries with it certain very definite consequences to society.

Of the 8,500,000 women gainfully employed in 1920, less than 2,000,000 were married; of the rest, a very large number will ultimately marry, but a very large number will also remain unmarried. Of the 1,000,000 professional women, less than 125,000 were married and a much larger proportion of them will remain unmarried. The average professional woman is older than her sister in industry, and therefore her chances of being married are already much reduced. The very economic independence of the average professional woman acts as a deterrent in many cases. Marriage will often involve a sacrifice of her comfort and independence. The woman who earns a competence in congenial work insists on economic standards which are often beyond the capacity of the men whom she knows and might possibly marry. Therein lies the problem which disturbs so many people to-day. Educated women have a choice to make—or rather they are too often forced into a situation where they must make a choice. Shall they seek the opportunity of marriage or shall they set for themselves the goal of a professional career, which, perhaps even in the majority of cases, involves a distinct impediment to marriage and home-making? We have not yet developed a condition in which both of these possibilities—

namely, the pursuit of a career and marriage—are readily and successfully combined in the life of the same woman.

From the point of view of the individual concerned, the pursuit of one of these alternatives as against the other involves inevitably the impoverishment of life. However great may be the success of a woman in the professions, the price is too high if she must forego marriage and the raising of a family. Professional women generally miss the home-making activities of their married sisters and regret the incompleteness of their personal experience. They admit the richest life includes the normal family relationships, and I have often been touched with the sense of defeat of highly successful women who have missed the privileges of motherhood and of normal family responsibility. On the other hand, there is possibly just as much regret on the part of an ever-increasing number of married women who find themselves on the shelf all too soon and unable to participate in the many outside activities for which they feel themselves amply prepared. Educated women insist on using their training, and apparently many of them find that a confining marriage limits their activity and intellectual growth. There is, therefore, a real conflict which most women have not yet learned how to adjust, resulting in the complexes and unrest which are so striking a characteristic of the modern woman.

From the point of view of the community, also, the choice of one of these alternatives as against the

other involves serious losses. Society demands mothers and happy families. When, therefore, women of leadership and of ability either do not marry or, when married, have few, if any, children, society is the loser. No community can afford to do without the children of able, well-educated women. These women also set the fashion for many others. On the other hand, the community loses in valuable service when abilities that are available in married women are not utilized. When women have been prepared for professional life and for important social service and fall out of the active world when they marry, there are serious losses. The valuable services which such women can render must not be scrapped. The community and the individual both pay too great a price when there is no adjustment between the two alternatives—namely, home-making and the pursuit of a professional career.

III

I have already intimated that the conflict which we are discussing arose out of the changed industrial situation which brought so many women out of their homes and gave them a taste of the interesting world outside. But probably equally important was the marked increase in the educational facilities for women which came concurrently with the industrial development of the last century. In America elementary education was available for girls as for boys from the

very beginning. It was only eighty years ago, however, that the field of public secondary education was opened up; it was extended rapidly throughout the country. Then came the opening of women's seminaries and colleges. To-day the education of women is in full flower. There is scarcely any restriction placed upon the education of our girls except the rather limited facilities of our institutions for higher learning. Hardly any girl of ambition or capacity is checked in her desire for an education, irrespective of the direction or extent of her special interest.

As a result we find this very interesting situation. In 1924 there were 1,963,000 girls as against 1,780,000 boys in the secondary schools reporting to the Federal Bureau of Education. The girls comprised 52 per cent and the boys 48 per cent of the total enrollment. The colleges are very close to telling the same tale. In all institutions of higher education reporting to the Federal Bureau of Education for 1924, including the teachers' colleges and normal schools, there was an enrollment of close to 461,000 young men and 449,000 young women; that is, 51 per cent of the total were young men and 49 per cent were young women. At Columbia University, during the same academic year, 57 per cent of the students were men and 43 per cent were women; although in the summer session at that University in 1923 the enrollment was 67 per cent women and 33 per cent men. Even if the facilities of the girls' colleges are limited, women are now being admitted to many institutions which

were heretofore restricted to men, and more and more of them are seeking admission to the state universities, which have generally been open to women on the same terms as to men.

Let us now examine the character of the education which young women have received in our colleges. Perhaps we shall be able to see how this has affected the life of their graduates. The development has been largely, if not altogether, in the hands of women themselves. Those who were responsible for the extension of higher education to women were women with a mission. They had overcome great difficulties themselves and were dedicated to the fine ideal of lifting similar disabilities from their sisters. The result was that the feminist point of view stamped itself upon these institutions from the very beginning. This shaped the curriculum and the atmosphere of the institutions. The faculties of the women's colleges were determined to prove that their students could do anything and everything that boys could do. What was good enough for boys was good enough for girls. Learning, they said, had no sex. What if the educational institutions for men needed thorough revising in their programs and in the aims to which they were dedicated? The founders of the women's schools apparently had no time to consider this vital matter.

Perhaps it was asking too much of these pioneers, so preoccupied with their own battles and victories, that they should have sufficient detachment to observe the inadequacies of the education offered to men and

to correct the defects before duplicating them in the new institutions for women. It was, in any case, easier to transplant whole the entire existing educational structure. The questions whether girls had a different rôle to play in the community; whether there were certain functions and duties that distinguished the life of women from that of men—these questions either were not raised at all or, when raised, found no expression in the course of study provided. Cultural subjects such as mathematics, the classics, the modern languages, and the fine arts, and a bowing acquaintance with the sciences, were provided. Little if any time was devoted to teaching personal and community hygiene. Physics, chemistry and mathematics were usually so taught as to avoid their practical bearings; as though these sciences would lose their cultural value if they were couched in terms of the everyday needs of modern people. Until Ellen Richards—a remarkable woman who has been too little appreciated in the field of woman's education—pointed the way, scarcely any instruction whatsoever was given in domestic science and in the practical arts. The result was that the curriculum almost altogether ignored any preparation for home-making as a career or the desirability of the married life as the ideal for which women should aim.

For most girls, the college course represented a break in the continuity of their lives. It took the developing girl out of her home and brought her into an artificial environment, where, cloistered in college

halls, she was surrounded almost entirely by unmarried women. Their influence on the young people was enormous and, whether they wished it or not, they in many cases set an example for many of the undergraduates. During the four critical years of college the girls were taken out of an environment where they could see young children and family life, and realize through constant association the true importance of the family unit, its innate beauty, its essential primal position in civilization. What was lost through lack of contact was not made good through clear-sighted and conscious instruction. No word was said in any of the courses, apparently, about the obligation and responsibilities of motherhood, or about the fundamental position of the family in our scheme of things. Instead, girls became dedicated to a life of purely academic interests; or, if a profession interested them, it was not the profession of home-making.

IV

Is it any wonder, then, that educated women do not marry? There are, of course, many reasons; some of them we have already discussed. There is the curriculum, which is clearly not developing an inclination on the part of young women to marry early, if at all. The courses educate girls away from matrimony rather than toward it. Then, too, the environment of girls during the college period contributes to this same tendency. There was until recently relatively little

opportunity for meeting young men. To-day, I am told, girls in colleges near those for men spend more time in social activities than the faculties think is good for them. But it is doubtful if this affects more than the small proportion of the most popular girls. The great majority are at college with a serious purpose. Especially among girls of strong personality there is early developed a desire to make good in a career.

At twenty-four or twenty-five the college graduate is thinking of other things than marriage, which seems to offer her little or no opportunity for personal development. She would try out her wings at teaching or in business, or in some professional pursuit. As never before, opportunities are opening up in affairs, and these appeal to her. Her whole enthusiasm during these vital years is for making good in her chosen work. Her friendships with men suffer because of her preoccupation. She is very likely, also, to improve her economic condition through her earnings if she is employed, and to develop higher standards of expenditure. She becomes "economically independent." In some such way as this there are ruled out of consideration the very young men who are the most likely husbands. These men are usually earning little while they are making roots in their own chosen field. In many cases they are men who have voluntarily turned their backs on the pursuit of riches and have devoted their lives to the scientific professions, to teaching, to the ministry, or to various types of social service. To marry any of them would mean hardships and sac-

rifice, and I imagine many young women hesitate to take the plunge. They thus lose their best opportunities for a satisfying marriage.

I am very well aware that this complicated phenomenon cannot be explained so easily, and that there are other causes at work than those we have listed. Nor am I an apologist for the critical attitude of many men toward college women, or for the shortsightedness of the community which makes it hard for the professional woman to continue her work after marriage without losing caste. I am attempting simply to single out a number of items which can be controlled and which, I believe, are playing a very large part in bringing about the fact that all too often in the past women have fitted themselves for special professional activity at the expense of participation in domestic life and especially in parenthood. It has repeatedly been shown that only about half of the women graduates of our colleges and universities marry; and those that do marry give birth to a strikingly small number of children, their average being less than two per couple. This is not a local or temporary condition, but a national tendency on an enormous scale. College women as well as men as a class are not replacing themselves in the next generation. To many it has seemed as if our educational system were an effective method of discovering our best stock and then proceeding at once toward sterilizing it. A new order of celibacy is growing up which is rapidly attracting our best people to its ranks. The

education of women is the fashion of the day. Ever greater numbers are availing themselves of the new opportunities. If higher education necessarily involves celibacy or sterility, the seriousness of the situation for society cannot be exaggerated, especially since, as I believe, this one-sided development implies a serious misfortune to the people themselves.

V

What is our solution? Shall we reduce the facilities of education for our young women or discourage careers and training for careers? I can hardly imagine anyone saying such a thing. We could not if we would, for women would have much to say about it. This is no longer the man-made world of our grandfathers. Nor would an impartial consideration of the facts permit any such silly conclusions. What is needed is a thoughtful and clear understanding of the greater social good that would come out of a coördination of social policy and individual ambition. The community needs educated and efficient women just as it needs educated and efficient men. The modern world can no longer do without either. But its very existence and continuity depend upon good home-makers and mothers. In other words, there can be no solution until ample provision is made in our educational system from the bottom to the top for the training of future home-makers, side by side with the training of women for professional and other careers.

One should always involve the other. Home-making must be considered a profession; in fact, a major profession. Success in it calls for all the ingenuity and intelligence of the best women. It should, therefore, receive the highest public esteem and approval.

All women, whatever their training, whatever their ultimate ambition, should receive instruction in the art of home-making as a matter of course. It should be assumed by our educators that every woman will marry and have a family. But it should be equally understood that many will wish to earn their living in productive work outside the home. Provision must therefore be made for the training of these women who have special aptitudes in the professions. Lest I appear too practical, I must emphasize the great importance of providing cultural opportunities in the curricula which are not particularly associated with home-making or practical affairs, but which are dedicated to the enlightenment and refinement of the personality. I can see no conflict among these three courses. And so I think of our colleges, and in fact of our entire educational system from the primary school up, as a mechanism which shall definitely adapt itself to the training of women for life in the fullest sense, and which, while it develops one group of faculties and interests, shall not forget others that are equally valuable.

These adaptations will not be so easily accomplished. They will require much thought and attention from our educational authorities, but it is a source of great

satisfaction to find that many of the girls' colleges have recently taken this matter under advisement and are adapting their curricula in these directions. The development of the Department of Euthenics at Vassar is a step in the right direction. The work of Professor Ethel Puffer Howes at Smith is of great significance. Other girls' colleges are wrestling with the same problem. Many now recognize that the developments of the past have been one-sided and disgenic. To-day they are encouraging robust health for the girls and are providing opportunities for developing the physique. They are beginning to emphasize the biological sciences that foster a healthy attitude toward the family. Girls are being taught more and more about community health. Training in the sciences, such as chemistry and mathematics, will be given, I believe, a more practical turn. Greater emphasis on community organization will come through the broad science of sociology. I believe the outlook is good for an early and thorough modification of the curricula in the girls' colleges which will stress the ideas we have been considering.

Personally I believe the greatest progress will come out of the development of the coeducational college. The growth of our state universities offers the best solution. In these, young men and young women see one another and work with one another throughout the college period. In this way is offset the baneful effect of the isolation that has heretofore characterized both colleges for men and colleges for women. Incidentally,

and without any special effort, there is developed in the minds of the young men and young women in coeducational institutions a healthy attitude toward the other sex. Provided there is not a disproportionate number of either group, such association is good social hygiene. We have learned to appreciate this in our elementary and secondary schools, but it has even greater value for our students in the colleges and universities. It will result in many friendships and in a large number of early and happy marriages. The salutary effect of such close contact between the sexes during the college years will be as noticeable on the young men as on the young women. There will be greater mutual understanding, and therefore greater respect and sympathy in the management of the details of family life—a most desirable thing, not only for the individuals concerned, but for society as well. Under such conditions more and more college women will be encouraged to take on the obligation of marriage and of home-making at younger ages, and, under the sympathetic encouragement of their husbands, many of them will wish, for a period at least, to engage in outside employment or professional work. I doubt very much that such adventures are likely to be less discriminating than the marriages of older people. After all, the college graduate is of voting age and of above average intelligence. Such evidence as we have concerning early marriage does not indicate any real hazard, but rather real gains for all concerned.

What shall be the community attitude toward these

women? I insist on constant accommodation to make the combination of professional activity and home-making mutually possible. There is no reason why women who are engaged in profitable activity should not, at the same time, engage in home-making. It should be thoroughly approved in so far as it can be accomplished without injury to the best interests of the home. We are creatures of fashion and do what our community expects us to do. If the community approves of this combination, more and more women will participate in it. There will, of course, be periods of absence from work when the children are coming and while they are young, when the mother's full attention must be directed to their welfare. But, even then, part-time work and free-lance jobs are always possible. The investigation which is being conducted under the general direction of Mrs. Howes at the Institute for the Coördination of Women's Interest at Smith College will disclose many opportunities for this type of activity. It is hoped also that investigations into the routine of domestic management will result in labor- and time-saving devices and procedures which will add to the freedom and leisure of young married women.

Teaching is the pursuit of the largest number of women outside of home-making. Six hundred thousand are now engaged in this field, and more and more are entering it. Heretofore they have swelled the ranks of the unmarried. But I can see no good reason for this misfortune. Those teachers who would marry

should be encouraged to do so and should by this fact not forfeit their position or standing in the community. Accommodation should be made for continued teaching, either as substitutes or for whole terms, as they find it possible. This will keep their proficiency at a high point until they can later—perhaps at forty-five, when their families have grown up —return to their professions with new zeal and without serious interruptions. Women who have brought up their own families should make the very best teachers because they have been mothers. A new vitality and vigor would animate our educational system if we could avail ourselves of the intelligence and sympathy of the large number of splendid women who have all of the pedagogical equipment but until now have not had the opportunity to serve the community in their own special field.

Finally, in the case of the large number of married women who do not participate in either full-time or part-time gainful employment, provision must be made for their increased participation in the varied activities of the community. There should always be opportunity for these well-trained and experienced women to express themselves in community affairs, which are being rapidly developed in so many directions. In our towns and cities, women's clubs and women's committees can play a more active part in social movements and become a most important factor in civic life. Women can achieve real leadership in educational policy; they can raise the standards of our schools, se-

cure reforms in politics, participate in town-planning —in short, bring about a newer and better social order. These opportunities for the educated home-maker will give rare satisfactions, comparable to those which spur professional and business women to higher achievement.

To my mind there is no longer legitimate reason for the conflict that has apparently existed in the past between professional careers and home-making. There is no necessity for women to make a deliberate choice of one alternative or the other. Why should they not round out their lives with many interests and carry on simultaneously different lines of activity—each in its proper place and each contributing directly to the fuller life? The answer to the question I have raised is to attack directly those items that have sharpened the division between the separate spheres in the past and to remove them. We must above all things learn to pay due honor to the mother and home-maker. Hers is the greatest service. For those who feel the necessity for self-expression in other fields, let there also be ample reward and honor, but always let us leave the door wide open for interchange between the two spheres, that they may cross and supplement each other. If our educators and leaders of public opinion will make the necessary accommodations and adjustments, the problem, I believe, will ultimately be solved.

CHAPTER XII

LIFE, DEATH, AND THE NEGRO[1]

IN AUGUST, 1619, a boatload of Negro slaves was landed at Jamestown by a Dutch man-of-war. Booker T. Washington has somewhere poignantly remarked that the *Mayflower*, which "brought to America the first seeds of civil and religious liberty, reached Plymouth a year later, 1620, so that Negro slavery is older than Anglo-Saxon liberty on the soil of the United States." With varying degrees of intensity, the slave trade flourished for nearly two centuries, until it was prohibited by law in 1808 and actually stopped by the Emancipation Proclamation in 1863.

From the outset, slavery was taken for granted in all the original Colonies except Georgia, which, under the leadership of Oglethorpe, prohibited the importation of both rum and slaves. But a clandestine trade flourished, and in 1750 the overt importation of slaves was authorized even in that Colony. The Negro furnished a much-desired labor supply. The opening of the country, with its rich agricultural resources, called for hands which the Colonists alone could not supply. The Indian was of little or no use on the farm, and the importation of indentured servants was prohibited near the end of the seventeenth century.

[1] Printed in *The American Mercury*, September, 1927, pp. 37-45.

At the beginning, the Negro was fairly evenly distributed along the Atlantic seaboard. But the experinent soon showed that he could be used advantageously only on the Southern plantations. He was not well adapted to the small, individualistic farms of the North; but the warm climate and the mass method of production in the South made him a most desirable and profitable laborer. Practically all the tobacco exported from Virginia, and all the indigo and rice of the Carolinas, were the fruit of his toil. But it was only after the invention of the cotton-gin, patented in 1794, that slave labor in the South became indispensable, and there began that concentration of Negroes in the cotton-growing states which lasted down to the end of the Civil War.

About 25,000 Negroes were brought into the country during the seventeenth century. In the first half of the century following, the importations numbered approximately 100,000. It is probable that the total number brought into the Colonies prior to the establishment of independence was 200,000. The survivors of these and their descendants accounted for somewhat over a half million in 1776. During the Revolution the importation of slaves was checked, and, because of the added hardships, the mortality of those already in the country was undoubtedly very heavy. With the close of the war, slavery was practically at an end in the North. By 1787, it had been legally terminated in all the states north of Maryland except New York and New Jersey, which followed suit a few years later.

The South, on the contrary, witnessed a post-war revival of the slave trade, marked by a significant change in popular temper. Slavery was no longer an experiment, but a vital and permanent necessity. In the rest of the country there was a widespread feeling at the time of the adoption of the Constitution that the whole theory of slavery was unsound, that it was morally indefensible, and that slave labor was uneconomic. This sentiment was accompanied by a strong movement to prohibit the importation of additional slave labor. The South refused to accede to this demand, although in the border states and in Virginia there was much anti-slavery feeling. But the opposition forced a compromise and after much debate it was agreed to incorporate a provision in the Constitution that the continued importation of slaves should cease in 1808. There is no accurate record of the number of Negroes imported during the last twenty years of the legal slave trade. Beyond question, the traffic was very brisk during this period. In the three years 1804 to 1807, for example, there were landed in Charleston no less than 39,075 slaves. One estimate has put the number imported between 1790 and 1808 at 90,000. The actual number was probably much larger.

II

Putting aside these conjectures, let us turn to the picture of Negro population growth as it is disclosed

by official figures. The Constitution provided for a regular census every ten years, and consequently, since 1790, our successive population figures have been fairly trustworthy. The first census showed that there were in the United States over 750,000 Negroes, of whom almost 60,000 were free. In other words, about one-fifth of the nation's total population was colored. Ninety-one per cent of this number were living in the Southern states. Virginia contained by far the largest number—292,627—followed in order by South Carolina, Maryland, and North Carolina, each of which states had more than 100,000 slaves. Every succeeding census thereafter showed a rapidly increasing number. By 1800, there were already over a million colored people. The Louisiana Purchase in 1803 brought in an additional 50,000 of whom six-sevenths were slaves. By 1810, there were nearly 1,400,000. The number had, therefore, almost doubled in the preceding twenty years—a very remarkable record.

It has always remained a difficult thing to account for this immense growth. The importations and the additions through the Louisiana Purchase, heavy as they were, could hardly account for more than a quarter of the increase. The rest was the result of the excess of births over deaths. Life on the whole in the Colonies was still not severe enough to interfere with a rather free increase of the race. Food and other necessities were plentiful and there was as yet too little concentration of population to cause serious inroads from disease. Taken by and large, health

conditions among the Negroes were probably not much worse than among the great mass of poor whites living in the South.

From 1810 onward we are concerned primarily with these 1,400,000 people and their descendants. For, on the whole, the increase of the Negro population in the United States since that date has been due to the reproduction of those then enumerated. In the early part of the nineteenth century, the increase was at the rate of about 2½ per cent a year, which means that the population doubled in thirty years. The 1840 census showed 2,874,000 Negroes. They again doubled in the next thirty-five years. By 1880 the population had increased to 6,581,000. Since then the rate of increase has markedly slowed up, and it will probably take until 1950, or a period of seventy-five years, for the population to double again. During the first sixty years of the last century the increase was almost 3,500,000, or 343 per cent. In contrast, the first sixty years of freedom showed a numerical increase of over 6,000,000, but at a rate of growth of only 136 per cent. As Professor W. F. Willcox, chief statistician of the 1900 census, points out, "the *amount* of increase in the later period was nearly double that in the earlier, but the *rate* of increase in the later period was only about four-tenths of that in the earlier."

From 1810 onward, when the colored people constituted 19 per cent of the total American population, each succeeding census has shown them forming a

smaller percentage of the whole. By 1860, that percentage was reduced to 14.1, and by 1920 to only 9.9. But this relative decline must not be misinterpreted. The steady numerical increase of the Negro from decade to decade has been almost altogether the result of the excess of births over deaths. The increase of the white population during the same interval has been due to two forces—first, the excess of births over deaths (natural increase), and second, immigration on an unprecedented scale. The millions of newcomers from Europe since 1850 have added tremendously to our white stock, and it is this fact that

TABLE 10

The Colored Population 1790-1920

Year	Colored population	Decennial increase per cent	Per cent of total population
1790	757,208		19.3
1800	1,002,037	32.33	18.9
1810	1,337,808	37.50	19.0
1820	1,771,656	28.59	18.4
1830	2,328,642	31.44	18.1
1840	2,873,648	23.40	16.8
1850	3,638,808	26.63	15.7
1860	4,441,830	22.07	14.1
1870	5,392,172[1]	21.35	13.5
1880	6,580,793	22.05	13.1
1890	7,488,676	13.80	11.9
1900	8,833,994	18.00	11.6
1910	9,827,763	11.20	10.7
1920	10,463,131	6.50	9.9

[1] The enumeration of the colored population in 1870 was very unreliable. The figure given in the table is an estimate by the Census Bureau.

is primarily responsible for the proportionate decline of the Negro to one-tenth of our total population. The figures for the *native* white population during the same period disclose the same phenomena, first, a declining rate of increase from decade to decade, and second, a decline in the relative proportion. The table on page 254 shows how the Negro population increased from decade to decade between 1790 and 1920.

III

As I have said, the greater part of the growth of the Negro population since the early days of the nineteenth century has been due to natural increase, the excess of births over deaths. All of it, however, cannot be attributed to this cause. Although the importation of Negroes was legally stopped in 1808, the contraband slave trade continued for a long period without marked abatement. Charleston, Mobile, Galveston and other ports were the centers of a flourishing and highly organized slave traffic. Dr. W. E. B. DuBois in his very interesting book, *The Suppression of the Slave Trade*, shows in great detail the amount of Negro smuggling practiced before the Civil War, and proves beyond question that thousands of Negroes were illegally brought into the United States every year. Other authorities confirm these facts from naval records and point out that the official efforts to stop the trade were utterly inadequate. Newspaper clippings, consular records, congressional debates, presiden-

tial messages and other executive documents speak frankly of the situation.

The decade between 1850 and 1860 witnessed the peak of this activity. It was estimated that during eighteen months in 1859 and 1860, eighty-five slave ships were fitted out in New York Harbor, and that these boats alone transported from 30,000 to 60,000 slaves annually. Probably the last slave ship was the *Lawrence*, which ran the Federal blockade during the Civil War and landed a boatload of slaves in Mobile in 1862. But as the trade was illicit, the records are very incomplete, and it is difficult to compute the exact number of Negroes imported between 1808 and the close of the Civil War. One conservative estimate places it at 270,000. Others run as high as 15,000 annually during certain years of the period, when the traffic was especially brisk. But even these maximum figures do not materially change the picture of natural growth presented by the census records prior to 1860. The unlawful trade in Negroes can at most account for an increase of less than one-half of 1 per cent a year. The rest of the increase, namely, about 2 per cent, or 20 per 1,000 per annum, represented the excess of births over deaths.

All records prove the great fertility of the Negro race. Of all the native stocks in America, it is and has always been the most prolific. What its actual birth rates were in the early days it is almost impossible to say, but they probably represented the very

limit of reproductive ability. In Africa, and in the United States later on, no restraints were practiced by the Negroes themselves; and during slavery days there was every incentive on the part of the slave-owners to stimulate child-bearing, since the offspring were of considerable economic value. The excess of births over deaths was not less than 20 per 1,000 of population per annum for a large part of the slavery period. In particularly favorable years, the figure may have reached even 25 per 1,000 per annum. As the death rate could not possibly have been less than 20 per 1,000 during any part of the period and was more likely between 25 and 30 in most years, the birth rate in all probability was not less than 45 per 1,000 and may well have reached the enormous rate of 55. Such fertility means a child almost every thirteen months during the period of maximum fertility. The colored people bred to the very limit of their reproductive capacity. The average number of children per mother was probably not less than nine, in spite of the high maternal mortality, which materially interfered with the completion of a normal reproductive history.

Turning now to the other item affecting natural increase, namely, mortality, one finds two conflicting opinions regarding the Negro prior to the Civil War. One holds that health conditions on the plantations were good; that the slaves were adequately housed and fed; that outdoor work, together with the strict

régime enforced, kept their morale high, and that in consequence the death rate was low and the life span of slaves long. The other view is that the horrors of the ocean voyage and the bad sanitary conditions of the Negro quarters on most Southern plantations resulted in an enormous death rate. Unfortunately, reliable statistics in the modern sense are almost nonexistent. The few figures available are for cities; whereas most of the Negroes lived in rural districts, where a different mortality prevailed.

According to the best authority, the conditions under which the Negroes lived on the plantations were fairly similar to those encountered by the poor whites on the surrounding farms; but they undoubtedly varied considerably from plantation to plantation, being dependent almost entirely upon the character and disposition of each individual slave-owner. The slaves of certain families lived under an almost ideal patriarchal system; on other plantations the cruelty practiced was almost beyond belief. Many Negroes died in the breaking-in process; but once acclimated, they did not, apparently, show an abnormally high death rate. The scanty literature contains no reference to any severe epidemics of disease especially malignant to Negroes. Like the whites, they suffered from smallpox, malaria, cholera, and to a lesser degree from yellow fever, but these diseases could not spread as rapidly among the rural population as they did in the cities.

Turning now to urban conditions, some records survive which show the comparative trend of Negro and white mortality during the first half of the nineteenth century. In such cities as Charleston, Savannah and New Orleans, the Negro death rates were very similar to those of the whites. The mortality, in general, was high, irrespective of race, in this era, for there had been no development of sanitary science. Yellow fever particularly affected the whites; cholera, the blacks. Thus in 1838, a yellow-fever year, the white mortality in Charleston was 54.6 per 1,000 as contrasted with 30.3 among the colored people. In 1836, a cholera year, this situation was reversed, the colored mortality being 51.0 per 1,000, and the white 24.6. In Savannah, shortly before the war, the white death rate was around 37 per 1,000; the colored, 34. In Mobile, the white death rate was much higher than the colored during the years between 1843 and 1855. On the other hand, in Baltimore, where a complete mortality record is available from 1812 onward, the Negro death rate was uniformly higher before the war than that of the white, except in 1821, 1853, 1854, and 1858.

As we move northward, we find the mortality among Negroes invariably higher than among whites. In Philadelphia, for example, between 1831 and 1840, the colored rate was approximately 31 per 1,000 per annum as compared with 22 for the whites. Other Northern cities, such as Boston, New Bedford, Providence and New York, disclosed the same state of

affairs. Summing up the evidence, it would appear that the mortality rate among the Negroes during the first sixty years of the last century varied from 25 to 35 per 1,000 per annum, and was, on the average, probably midway between these two extremes. Apparently the period just before the Civil War saw the Negroes enjoying the best health that the race had ever witnessed, up to that time, in America.

The problems of Negro health and longevity came to a head not during the period of slavery, but with the Civil War and the years of Reconstruction. There is general agreement that, after the war, the plight of the Negro was pitiful indeed. Neither in the cities nor on the farms were there adequate work, food, and shelter for him, and so destitution was general. The Richmond *Enquirer* for November 22, 1867, remarked that "at no period during the existence of slavery in Virginia was the physical and moral condition of the great mass of the Negro population worse than it is at present." The newly freed slave was undisciplined, he lacked sufficient food and clothing, and was forced into the most unsanitary habitations. During the last years of the 'sixties and in the 'seventies he was dying off at a truly appalling rate. Tuberculosis and syphilis became especially rampant. High birth rates under the prevailing conditions of life led only to frightfully high infant death rates. In this way the foundations for the very trying health problems of recent decades were laid.

IV

This brings us to the modern era, marked by the development of sanitation and public-health work. While designed primarily for the white population, the reverberations of this campaign have profoundly influenced the Negro as well. The pessimism which prevailed thirty and more years ago with regard to his future is now no longer even remotely justified. The doleful prophecies of those who saw the race problem solved through his extinction have been absolutely discredited by recent events. A race which lives in many areas under what are still rather primitive conditions of sanitation is to-day enjoying an expectation of life of about forty-six years, which is equal to that of white Americans only thirty years ago. In comparison with a death rate of 35 to 40 per 1,000 in Reconstruction days, the Negro mortality is now only about 17 per 1,000—a death rate about the same as the rate for a number of European countries before the World War.

This is a very great achievement if we keep in mind that the Negroes have had control of their own destinies for but a little more than half a century, and have been served by health-conserving agencies for even a shorter period. But it should be kept in mind that the Negro is physically a well-organized individual with a marked capacity for a long life-span. Even during slavery days many Negroes attained to extreme old age. Under present conditions there is evidence

on all sides of the capacity of the Negro to round out a good expectation. At about the age of fifty, the expectation of life of Negro males is under one year less than that of white males, and of Negro females a little over two years less. The recent gains in the average length of life are entirely commensurate with those of the white population. This fact alone holds out the greatest promise for the future of the Negro in America.

Possibly the very best indication of what has happened to him in recent decades is afforded, not by the scanty records from official sources, which cover only a fraction of the Negro population and which are much belated, but by the current experience of the Metropolitan Life Insurance Company, which has on its books more than 2,000,000 individuals of the race, a fifth of the total colored population. These policyholders include men, women and children of all ages, and workers in every conceivable occupation are represented. Their mortality record shows a decline of 16.3 per cent in the death rate in the short period of fifteen years, from 17.5 per 1,000 in 1911 to 14.6 per 1,000 in 1926. This is all the more striking because the insured are, on the whole, an urban people, and health conditions among Negroes in the cities have always been less satisfactory than on the farms.

The most gratifying item has been the improvement in the mortality from tuberculosis. Since the Civil War this disease has been outstanding as a cause of death among the colored people. There is little ac-

curate information about the amount of it that existed during the slavery period. But since 1865 there is no doubt of the Negro's great susceptibility to this disease and the high mortality resulting from it. Even at the present time, one out of every six colored persons dies of tuberculosis. But between 1911 and 1926 there was a 44 per cent decline in the tuberculosis death rate. Out of every 100,000 living colored persons, 418 died of tuberculosis in the year 1911, and only 235 in 1926.

Tuberculosis among colored policyholders has now reached the same position as it had among whites about thirty years ago, when the active campaign against it began. The disease has declined 54.5 per cent in the same period among colored children. But it is still a scourge among them, for in 1925 the rate of mortality was almost six times as high among colored boys and girls as it was among white children of the same ages. There is every reason to believe, however, that the improvement of the last decades will continue. The colored people have, as a race, good physiques and they are learning all the time to take better care of themselves in relation to their changing environment. In their native habitat, tuberculosis was either unknown or only slightly prevalent. There is no reason, therefore, why they should not ultimately have as low a tuberculosis death rate as any group of the American population in similar economic circumstances.

Heavy infant and child mortality rates have always

been the rule in this country among the Negroes. But in recent years they have made marked gains in overcoming this handicap. In 1911 the total mortality rate for insured Negro children from one to fifteen years of age was 10.1 per thousand. In 1926, this figure was reduced to 6.3, which is an improvement of 38 per cent—the greatest improvement in mortality achieved by any age group. All four of the principal communicable diseases of children have declined greatly. Scarlet fever mortality dropped 45 per cent, measles 31 per cent, whooping cough 42 per cent, and diphtheria 34 per cent. As the newest preventive therapy penetrates to the colored population, the mortality from all these diseases will probably be reduced to negligible proportions. The mortality from diarrhœa and enteritis was reduced more than 50 per cent in the fifteen-year period, showing that colored mothers have not been slow to learn how to care for and feed their babies.

But the improvement in the sanitary conditions which surround the colored people is best evidenced by the decline in typhoid fever and pneumonia. In 1911, 46 out of every 100,000 Negroes died of typhoid fever; whereas in 1926 only 9 deaths were attributable to that disease. As the majority of colored policyholders still live in the South, where typhoid fever is much more prevalent than in the North and West, the marked reduction in the number of deaths from this disease is an amazing achievement. The improvement in pneumonia is not quite so great and yet it is

significant. In 1911 the rate was 161 per 100,000; in 1926, it had been reduced to 146, or a decline of 9.3 per cent. It should be remembered, also, that the last few years have been pneumonia years on account of the extensive influenza epidemics which have raged over a wide area of the country but often with special virulence in the Southern states. The decline in pneumonia would undoubtedly have been greater but for this.

V

At the same time we must not overlook certain unfavorable features in the health picture of the colored people. The high mortality rate which still prevails results largely from the prevalence of the chronic degenerative diseases, such as cerebral hemorrhage, organic diseases of the heart, and chronic nephritis. All three of these conditions show substantial increases since 1911. Likewise, deaths from cancer and diabetes increased markedly between 1911 and 1926. The five diseases just mentioned, when combined, account for 36.3 per cent of the total mortality of colored policyholders, and it is disconcerting to observe that these deadly maladies are increasing rather than diminishing.

The very great prevalence of syphilitic infection among Negroes tends to keep the rates from all degenerative diseases high. Syphilis and its sequelæ, indeed, probably account for the difference between the mortality of the colored people and that of the whites. In 1926, the Negro death rate from syphilis,

locomotor ataxia, and general paralysis of the insane (the last two of which are syphilitic in origin) was 41.1 per 100,000. This is double the rate of 1911 (20.4 per 100,000). These diseases still work havoc among the colored people, especially among city dwellers. Their worst effect is on the new generation because the greatest toll is taken during the first month of life. They are responsible for many of the still-births that occur among colored women. They also account for a great many deaths later in life, ascribed by physicians to heart and arterial conditions, and they are probably at the bottom of a great many cases of tuberculosis. From every angle, these venereal diseases appear to be the most important single obstacle in the health progress of the race.

In addition to these two unfavorable factors—that is, the high prevalence of the venereal and the degenerative diseases—there is a third, the full significance of which we cannot yet appraise. Despite the general decline in the last two decades, the death rates among the colored people have increased in the last four or five years, and in 1926 the rate among insured Negroes was actually 9.1 per cent higher than it was in 1921. There is every reason to believe that when the figures for the general colored population become available they will show the same drift. It may well be that this change in tendency is only a temporary one, but it is of interest nevertheless to find out what causes are operating to bring it about. The recent migration from the rural to the urban centers and from the

South to the North is an important item. Negroes in America have always been primarily an agricultural people, and it was on the farm that they found their most favorable milieu. The twentieth century first saw a shift in their occupations. The opening of industries in the South gave opportunity for their employment on a considerable scale, and the World War, with its increased industrial activity, hastened this tendency. Manufacturing plants sprang up like mushrooms in various parts of the country. European immigration, which had practically supplied all of the unskilled labor needed by Northern plants, was first checked and later almost altogether cut off by the post-war immigration laws. As a consequence, Negroes in large numbers were encouraged to come North and fill the labor vacancy. Workers from Southern farms thus found themselves exposed to work in iron and steel mills, in coal mines, in railroad and highway construction, and in other industries where the hazards were many and the effort very exacting. Between 1900 and 1920, the number of those in agricultural pursuits declined from 54 per cent of those gainfully employed to 44 per cent. Twenty per cent were engaged in manufacturing and mechanical industries in 1920 and 11 per cent in trade and transportation, as contrasted with 7 and 5 per cent in 1900.

Altogether, possibly a million Negroes moved from the easy, leisurely life in the South to the more trying environment of the Northern cities. The migration was largely concentrated in a few industrial cen-

ters, such as Chicago, Detroit, Pittsburgh, and New York. In the decade 1910 to 1920, the colored population of Chicago increased 148 per cent, that of Detroit 611 per cent, and that of Cleveland 308 per cent. Immense Negro communities have been built up in these cities. Over a million, or 73 per cent of the Negro population of the North was living in 1920 in ten such centers. Housing facilities were entirely inadequate to take care of the influx, and many hardships were undoubtedly suffered by the workers and their wives and children. The picture as to mortality, however, is somewhat confusing. The migration which located in New York City and its environs brought with it no increase in mortality, but rather an improvement. On the other hand, the death rate increased markedly in Chicago, Detroit and a number of other cities. Possibly more important even than the higher mortality is the fact that the northward and urban migration cut deeply into the birth rate of the Negro people. It is a serious matter that between 1915 and 1923 there were more deaths of Negroes than births in the cities and towns of the country. It is only in the rural areas of the South that there is now an appreciable excess of births over deaths. This is the only place where Negro birth rates have remained high and death rates are fairly low.

A characteristic of the recent migration is its transitory nature. Many Negroes who came North immediately after the late War returned South during the industrial depression of 1921 and again migrated after

business picked up in 1922. During the past ten years several hundred thousand have moved from the South to the North and then back again. Many workers come North for the summer and go back home to avoid the harsh Northern winters. Such migrations are not conducive to low sickness and death rates. But this movement, after all, affects only a fraction of the total population and its effect cannot be such as to interfere permanently with the improvement of the health of the colored people. The fact is that there has been a very great improvement in the economic status of the Negro. His very ability to come North in such large numbers, lured by high wages, has effected a change for the better in the economic and social status of his brothers who have remained South. Wages are everywhere higher and employment is more certain and continuous.

A striking evidence of the new prosperity of the South is the freshness and activity of the towns and villages where Negroes live. Roads, new homes, and schools and churches are being built on an immense scale. New paint is everywhere in sight. Banks, managed by Negroes for Negroes, are increasing in number, and the savings on deposit are mounting. These are powerful factors in improving the status of the Negro. A new consciousness of power and of worth-whileness is everywhere manifested. There is evidence of intelligent leadership directing the energies of the young people into constructive channels. The number of children at school and of teachers in train-

ing is rapidly increasing. Probably no single American group is experiencing so deep and so intelligent a revival of latent power as is the Negro to-day.

VI

This leads to a consideration of the future outlook for the race from the demographic standpoint. The reader must have already observed the optimism of the writer as to the future of these people. It is still difficult to say how far the movement toward the city and especially to the cities of the North will go, but undoubtedly the Negro will eventually find his best interests served by staying in the South, where adjustments will make his life easier and richer. His interests will be best served by remaining largely on the farms, where his energies, in general, will be best rewarded.

The extent of the increase of American Negroes in the future is largely a matter of conjecture. We can only be guided by the history of the race during the last century and a half, by our knowledge of the habits of the people, and by the present tendencies of the birth and death rates. A consideration of these items according to the most approved statistical methods, namely, those developed by Dr. Raymond Pearl of the Johns Hopkins University, suggests that the maximum number of the race will be about 15,000,000. By the year 2000, the Negro population of the United States will be approximately 14,500,000, that is, about a half million short of the ultimate figure. The next

three-quarters of a century will, therefore, see an increase of about 3,500,000 in the present Negro population, or about 32 per cent. But this increase will be largely concentrated into the first half of the period, gradually diminishing until at the end of the century a stationary population will be reached.

At the present time, the Negro population is increasing at the rate of close to one-half of 1 per cent a year, in contrast with a rate of about 2½ per cent a year a little over a century ago. But it must not be supposed that this decline is limited to the colored people. A similar change has occurred in the entire population. The rate of natural increase is rapidly declining. If we continue our present immigration policy, as seems very likely, the American people will, in the year 2000, number under 185,000,000. This means that, at that time, the colored people will constitute just under 8 per cent of the total. To-day they constitute close to 10 per cent.

The future, therefore, will see but small change in the relative numerical importance of the Negro, unless, of course, some unforeseen circumstances should distort the picture. He is here for good, and the years to come will probably see him playing an increasingly important and worthy part in the affairs of the country. His achievements in America will be ultimately recognized not only as the greatest experiment in racial adjustments ever undertaken by man, but as the most encouraging and gratifying episode in our national life.

CHAPTER XIII

HEALTH OF THE WORKERS[1]

THE health of the worker is a large subject, and I have chosen to discuss it from a rather special angle. I am not a physician—not even an industrial hygienist. I am an insurance statistician interested particularly in public health. My position gives me an excellent opportunity to observe conditions of life and of health among the American people and especially among the wage-earners of the country. Industrial workers constitute four-fifths of the 8,000,000 men who are insured in the Metropolitan Life Insurance Company. The records which pass through my office permit observation of the forces that tend either to extend or to diminish the life span of these insured. I have thus learned some of the effects of industry on the life of the American people.

Discussion of this subject is especially pertinent in the State of New York. It is not only the most densely populated state in the Union, but it has also the largest number of persons engaged in industry; there is the widest variety of industries included, and the

[1] Address delivered before the Eighth Annual Industrial Conference of the New York Department of Labor, December 4, 1924. Printed in the *Monthly Labor Review*, January, 1925, U. S. Department of Labor.

greatest value in the products manufactured. Outside of mining, every important field of work is extensively represented. If industry is affecting the lives of workers in a deleterious or in a favorable manner, it should be possible to disclose the facts in a state like New York, and it should be possible with the good will and progressive spirit that prevails in the state at the present time to remedy any evils that are found. The benefits of such progress would ultimately spread from this locality over the whole nation.

II

There are some facts which are basic to any discussion of this subject. In the first place, the industrial workers of the country, taken by and large, may be distinguished by a marked diminution in their longevity from those who are engaged in other forms of employment, such as agriculture, the commercial and professional pursuits, etc. At the present time the expectation of life of men at age twenty engaged in industrial pursuits is forty-two years. This means that they may expect on the average to attain the age of sixty-two. On the other hand, those who are not engaged in industry may expect an additional forty-nine years at age twenty. There would, therefore, seem to be a difference of about seven years in the average expectation of the two groups. This difference should not be charged altogether to the effects of industry, because such items as economic status, nationality, and

the general level of intelligence all influence greatly the expectation of life. But if a single item were to be selected as the most important determining factor in the lives of men, occupation would probably come nearer to expressing the truth than any other.

The handicap of seven years in the expectation of life is in the nature of a tax which millions of men who are engaged in industry pay under present conditions. It is a measurable and a very real burden which might readily be expected from the very nature of industrial employment and the mode of life of workers. This is, however, not the only tax which they pay. Possibly more important, but unfortunately less easily measured, is the tax of illness and of disabilty which is laid upon men in industrial pursuits. We, in the Metropolitan, some years ago studied the amount of sickness prevailing among policyholders and found an average loss of working time of eight days per annum for gainfully employed men. My impression is that the actual loss is a good deal heavier than that, since much illness goes unrecorded. It is, however, impossible in our present state of knowledge to say whether this figure of eight days per annum is more or less than that prevailing in the general population or among other groups of occupied persons. It may well be less because of psychological factors on the one hand and the excellent physical endowment of industrial workers when entering their working careers. Men who are engaged in industry and whose daily wages are vital to their families will often con-

tinue to work under conditions of personal health which would, very properly, impel clerical and professional employees to quit and seek medical advice and treatment. The economic pressure is powerful enough to keep men on the job after common sense and medical judgment would suggest a vacation or even periods of medical attention in hospitals or other institutions. The figures now available, therefore, hardly indicate the true loss from illness among industrial workers. We must, therefore, study our mortality figures as the best indicators of the effect which industrial employment has upon life and health.

III

What items account for the reduction of seven years in the expectation of life among those engaged in industry? Some of them are quite obvious; others are less so, and we can only guess at their cause. The extra hazard from accident is important. Among industrial workers the death rate from accidental causes is about two and a half times that for the nonindustrial group. At the present time well over 2,000 workmen (a rate of about 500 per 1,000,000 persons employed) are killed each year in occupation accidents in New York State. This includes those deaths that are reported to the state compensation board, as well as those reported to other governmental agencies. I estimate that these accidents decrease the life span of all workers about one year on the average.

Tuberculosis is even more important than accidents and is responsible for a loss of between eighteen months and two years in the longevity of workers. I have for years held that industrial employment is probably the most important single factor in the tuberculosis death rate. The problem of controlling tuberculosis is to-day largely concentrated in the industrial classes. This fact is made very clear when we examine the death rates from tuberculosis among industrial workers and among the nonindustrial—that is, the professional, mercantile, and agricultural groups. Age period for age period, the death rates still remain from two to three times as high in the one class as in the other. The rates for males during the working period of life are also about twice as high as for females of the same age and economic status; whereas the figures are slightly higher for females than for males up to age twenty-five. Heredity and other innate differences play some part; but, in my opinion, they account only in a minor degree for the disparity in the figures. The term "industry" is here used in its broadest connotation to include the effects of the dusts inevitable in certain trades, excessive fatigue, bad posture, crowded workrooms, and other conditions of employment which make the worker more susceptible to deleterious home influences. These circumstances surround all workers and not only those who are especially exposed to this disease. When we consider those occupations which have long been associated with an unusually high incidence of tuberculosis, we find a

mortality eight, ten, and even twelve times the rate for farmers, who hardly ever suffer from tuberculosis as a result of their occupation. New York State should be especially concerned over this matter, since stone-cutters, sand-blasters, grinders, and other workers with extremely high tuberculosis death rates are found in large numbers here.

Pneumonia is twice as high among industrial as among nonindustrial workers and may, therefore, be considered an added occupational hazard. Possibly the loss in life expectation resulting from this cause is as great as that from industrial accidents. There is, however, some uncertainty concerning our data, and we cannot press this point too far at this time. There can be no doubt, however, that occupations exposing their workers to dust, to dampness, to extreme changes in temperature, and to fumes and gases are conducive to the development of pneumonia, which only too often results fatally. Further research is still needed to clarify the relation between industry and the development of pneumonia.

In like manner, the degenerative diseases, such as cerebral hemorrhage, Bright's disease, and organic heart disease, show strikingly the effects of industrial exposure. The death rates are two and three times as high as in the nonindustrial groups during the active working years of life. These high rates probably reflect the results of long-continued strenuous labor, of heat, of marked changes in temperature, and, in some instances, of specific occupational poisoning. These

conditions in their early stages are usually very difficult to diagnose and later lose the indications of their occupational origin. The true picture is, therefore, probably worse than would appear from the records of mortality.

This leads us to a consideration of the problem of the particular hazards inherent in certain industrial processes. A fairly large number of workers in a variety of occupations are exposed to the effects of specific poisons and to definite occupational diseases. The hazard in these employments is often acute, and the aggregate effect on health is considerable. Included under this head are those who are engaged in the industries using lead, brass, mercury, arsenic, benzene, aniline, wood alcohol; those who work with hides and skins; and the caisson workers. The number of immediate deaths is probably not large; but the indirect effects can be noted in the curtailed efficiency of workers in these trades, in long periods of illness and disability, and especially in cases of heart disease and kidney disease which strike men down prematurely —often without disclosing the original occupational cause of the fatal disease.

Because of these facts enlightened states have established agencies of government to remedy the conditions described. State departments of labor with divisions of industrial hygiene have been organized. New York State has not been behind the others, but has, in many respects, been a leader. On paper, at least, the State Department of Labor has the machinery to grapple

with those conditions of industry which unfavorably affect the health of workers. But no one is more aware of the limitations of his present organization than the Commissioner of Labor and the Director of the Division of Industrial Hygiene. Knowing so well the true situation in industry and the limited resources with which they can work, they, above all others, recognize the great possibilities which would follow from extending their service and increasing its efficiency. They realize clearly that the existing official agencies of the State of New York have hardly scratched the surface in the field of industrial hygiene.

IV

In spite of the fact that the law requires the reporting of occupational disease and even provides compensation for disabilities resulting therefrom, the number of cases reported, whether compensated or not, is very small if we consider the large number of persons exposed to industrial hazards. For the ten-month period ending June 30, 1925, there were reported to the Department of Labor only 163 cases of occupational disease. The State compensation report for the year ending June 30, 1926, shows 1,437 cases of occupational disease and poisoning, including injuries due to corrosive substances. The disparity between these two figures is due to the fact that many compensable diseases or poisonings are not required to be reported. Moreover, even the large figure for the com-

pensable diseases is a serious understatement, as many types of industrial illness are not covered by the Compensation Act. The occupational dermatoses are not reportable in New York State, but in Ohio, where they are, there were reported annually an average of 560 such cases per year for a period of two and a half years. Obviously, the law calling for the reporting of occupational disease must be revised, extended and then enforced.

For a correct appraisal of the incidence of occupational diseases and poisonings we must turn to the experience of the Massachusetts General Hospital. Every patient coming to the out-patient department of that institution was interviewed by an assistant familiar with the hazards of industry. All cases which could possibly be of occupational origin were referred to the industrial clinic under Dr. Wade Wright. In this way 5,000 out of a total of 32,000 patients were referred to the industrial clinic, and approximately 2,000 of them were ultimately found to be suffering from occupational disorders of one kind or another. In other words, about 6 per cent of those who came to the out-patient service of a large general hospital appeared to be in need of specialized treatment or the advice of an industrial physician. During the first year of the clinic (which was established in March, 1916) there were found 148 cases of lead poisoning. Contrast this number with the 133 cases reported in the whole State of New York between the dates of

September 1, 1916, and August 31, 1917. And later years have shown a still smaller number of cases reported in New York State. Obviously, this is not an accurate picture of the amount of lead poisoning existing. Undoubtedly, were there better facilities for examination and diagnosis, additional cases would be discovered. In this respect the experience of the Massachusetts General Hospital offers a vivid demonstration of what would probably be found in New York State if more intensive examinations were made of industrial workers.

To-day New York State, apart from the new Reconstruction Hospital, does not have such facilities for the discovery of occupational disease anywhere. If cases are discovered it is only because the worker happens to fall into the hands of an unusually enlightened physician or because his condition is extreme. Numbers of cases of incipient disease go undiscovered, and often conditions which might easily be arrested are allowed to become acute and advance to a state of permanent impairment. Dr. Cofer is fully aware of this situation, and his purpose in appointing an advisory board in the field of industrial hygiene is, frankly, to further the program of the State Department along these lines. At our conferences a number of constructive suggestions have been made, but these will not progress very far without the cooperation and the good will of those who are interested in the conditions of industrial employment in this State.

v

The first and most important asset is the help of the medical profession. The 17,000 physicians of the State of New York must somehow or other be taught that there is a problem of industrial hygiene. To date they do not seem to have heard of its existence. They either do not find industrial diseases or else do not report those they do discover. The remedy for this condition is, of course, not easily applied. It means endless education and a changed point of view among the faculties of the medical schools preparing the new generation of physicians. The medical societies of the state can also give great help in this work of education through the medium of their official journals. A well-written page or a section devoted to industrial hygiene appearing as a regular feature of the magazine will serve to bring to the attention of many medical readers the paramount importance of this subject. The state medical society can render the greatest possible service in advancing this movement.

The next step after the education of the medical profession is the education of the workers themselves. Much can be accomplished through organizations such as the labor unions and their health centers and the various mutual benefit associations. Information adapted to individual industries should be distributed as widely as possible throughout those industries. The State Department of Labor can well afford to supply such groups of workers with qualified speakers and

with the simple pamphlets of instruction which the division of industrial hygiene has prepared to cover the specific hazards of the group. Workers should be taught what dangers they must avoid in the course of their everyday employment. When they know more about the hazards of their occupation they will exercise greater care. They will utilize the various protective devices provided, and consequently there will be less risk of exposure due to the negligence of workers. It is also absolutely essential that they be taught the early signs of illness so they may insist upon helpful medical care and thus avert a more serious physical breakdown later on.

The employer likewise has a most important part to play in the new field of industrial hygiene. He is vitally concerned in this problem because it is to his interest to have his employees keep well. His profits depend upon continuity in employment and the smooth running of his plant. Naturally he cannot run his establishment efficiently if the physical condition of his workers is below par. Moreover, he is sympathetic and desires the well-being of his employees. He will do his level best to remedy hazardous conditions when he knows what they are and how they may be prevented. He is usually willing to cooperate with the State Department of Labor and open his factory for inspection when such investigations are made by competent persons. The current tendency in industry is for more sanitary shops and improved conditions of work. Employers are anxious to do the right thing

both because of their natural innate decency of feeling and also because they realize that it pays to keep their men well. The value of better industrial hygiene is reckoned in many indirect ways—from the better industrial relationship prevailing between management and men; from decreased periods of illness; the better work turned out; diminished labor turnover; and in countless other ways. The good will of employers can be relied upon, provided they are told the truth and urged to participate in a progressive program. This necessarily implies that the state department must have the right kind of an inspection force; that the factory investigators shall be competent to pass on general matters of sanitation; and that there shall be experts on the staff who can solve complicated problems of ventilation, shop organization, and manufacturing processes. No state plan will succeed which overlooks the necessity of enlisting the cooperation of the employer.

Thus far our program has been one of education. We have mentioned the necessity for enlisting the cooperation of the physicians, of the workers, and of the employers. Nor must we overlook the power of the press in this campaign. An efficient publicity service constantly on the job functioning as an integral part of the State Department of Labor can disseminate a vast amount of information and secure increased good will for the industrial hygiene program. The newspapers are only too glad to be of service in this respect if they know what the movement is about and how

eager the great mass of readers is for real knowledge on the subject of health and personal hygiene. Such lay interest would react favorably upon the attitude of both the medical profession and the employers.

VI

But probably the most constructive activity that can be undertaken is the establishment of industrial clinics in connection with our large general hospitals. Such clinics would function as one of the special services in a general hospital organization. What has been done so successfully at the Massachusetts General Hospital can be repeated here. There are adequate financial resources available, and beyond question there is great need for such a medical service. It should be possible to organize in existing general hospitals three or four industrial clinics under the directorship of physicians trained to diagnose and treat conditions due to occupation. Such clinics might, perhaps, be run under the auspices of the State Department of Labor and in any case with its cooperation and interest. Dr. Wade Wright has made the important point which should again be emphasized—that such clinics must have facilities for selecting their cases. Possibly patients should be referred to them through the assistance of a social worker who is on the staff of the general admission room of the hospital. In an industrial center like New York, it is hard to understand how any large general hospital can afford to be without an industrial clinic.

A staff familiar with manufacturing processes and the hazards of industry would seem to be absolutely necessary, since so many of the complaints compelling admittance to the hospital are the direct result of the work the patients are engaged in. Many cases must continue to go undiagnosed and inadequately treated unless such facilities as we have suggested are added—so common are disorders of industrial origin.

The organization of such clinics will be hailed as a great forward step in the active campaign now being waged against disease in all its forms. The vital thing is to extend these facilities to all the industrial areas of the state. This would mean establishing industrial clinics in places like Buffalo, Rochester and Schenectady and enlarging and improving the service now available in the various boroughs of New York City. Possibly the program up-state would be most successful if it were correlated with the work of the State Department of Health, which has given great service through holding traveling tuberculosis clinics all over the state. It is, therefore, already carrying on an important activity of industrial clinics, as I conceive them. These existing traveling clinics could easily be expanded in scope if an industrial hygienist accompanied the group. A physician with such specialized training would be in a strategic position to discover the effects of poisonings and the results of occupational exposures of all sorts. The machinery is available. It only calls for extension and a more definite conception of the newer purpose.

The opportunity is large, the stakes are considerable, and the time is ripe for the extensive development of a program far more comprehensive than the present one, adequately supported by public funds and stimulated by the approval of an aroused and sympathetic public.

CHAPTER XIV

HAS PROHIBITION IMPROVED THE PUBLIC HEALTH?[1]

I KNOW of no subject which in recent years has lent itself to more acrimonious and futile debate than the effect which the prohibition legislation may or may not have had on public welfare. On the one hand, there are those who trace virtually every favorable condition now prevailing in our country, including our unprecedented prosperity, to this enactment. On the other, writers and speakers equally sincere utterly condemn the amendment and the enabling legislation because of its alleged corrupting and withering influence on the nation. They insist that we are becoming a nation of liars and of petty lawbreakers; that the flood of bad liquor is undermining the morals and health of our youth, and that these evils will grow with the passage of time unless we face about and change materially the letter and spirit of the enforcement law. It is not my wish to add anything of a controversial character to this debate. I shall try rather to present a few new facts that are now available after a rather painstaking study which bears on the state of the public health during the recent years.

[1] An address presented before the 56th Annual Meeting of the American Public Health Association. Printed in *The American Journal of Public Health*, January, 1928, page 1.

I shall attempt to relate these facts to the prohibition situation, but this will not be an easy task. The time that has elapsed is short, the records often defective, and the results confusing. Nevertheless, if we can keep our discussion free of bias, we may be able to throw light on the relationship between the new legislation and the public welfare.

II

The best available index of the public health in the United States is the death rate. Reliable figures on the amount of sickness are almost altogether lacking. Two sets of mortality data are available. The first covers the general population residing in a large area of the country, known as the United States Death Registration Area as constituted in 1900. These are the six New England states, New York, New Jersey, Michigan and Indiana. Together, these ten states contain 26.1 per cent of the total population of the country. Records of mortality have been kept with great accuracy in this area for the entire period since 1900. These states, moreover, are fairly representative of the country as a whole. While their people live chiefly in urban industrial areas, they have also a fair proportion of rural residents, namely, 25.0 per cent. The second group is composed of millions of men, women and children, who are insured in the Metropolitan Life Insurance Company and whose mortality experience it has been possible to follow very

closely since 1911. They live in the cities and towns of the United States and Canada almost entirely. But, fortunately, they form so large a proportion of the communities in which they live that the very accurate figures we have on their life and health will do much to supplement the information that is available from the more limited public sources.

To observe the effect of the prohibition amendment, it is necessary to divide the period covered by the data 1900 to 1926 into two parts, namely, that prior to the adoption of the amendment and the period subsequent thereto. The year 1920 saw the establishment of national prohibition. That year would, therefore, seem to be the dividing line. Practically, it would be better to consider the earlier period as running from 1900 to 1917, inclusive, because the last three years, 1918, 1919 and 1920 were severely disturbed by the prevalence of the influenza pandemic, which distorted the mortality picture and gave an utterly false twist to the trend of mortality during the previous two decades. We shall, therefore, contrast the trends of population mortality in the two periods that, from 1900 to 1917, inclusive, with that from 1921 to 1926, inclusive.

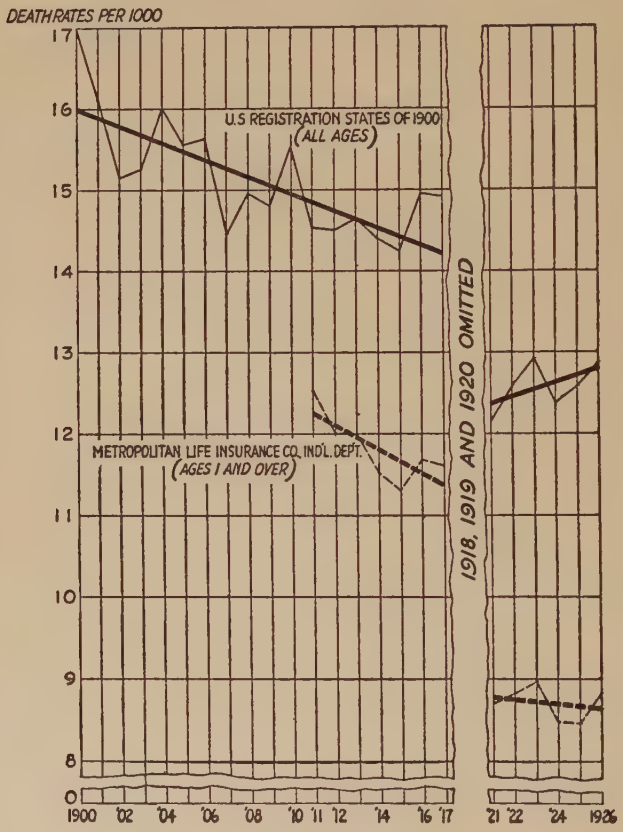
The upper part of Chart XVI shows what has happened to the death rate in the general population of the original registration states. There was an improvement in mortality in the first eighteen years, as is clearly indicated by the sharp downward inclination of the *trend line*. This is the heavy straight line run-

ning diagonally across the chart from 16 per 1,000 on the left in 1900 to a point a little over 14 per 1,000 on the right in 1917. It is the straight line which best shows the tendency of the death rate during the period when the actual death rates varied widely from year to year, as is shown by the lighter jagged line. The average death rate in this pre-prohibition era was 15.15 per 1,000 per annum, and the decline over the entire period was .10 deaths per 1,000 of population per annum. The second, or what may be broadly called the prohibition period, from 1921 to 1926, inclusive, presents a different picture. The mortality is on a much lower level than in the earlier years. The six-year average death rate was 12.58 per thousand; but, on the other hand, the trend of mortality (again indicated by the heavy straight line) is no longer downward. There is now a rising tendency, the actual rise being .09 deaths per 1,000 per annum, or about as rapid an increase as was the decrease in the earlier and pre-prohibition period.

A somewhat different situation appears to have prevailed among the insured lives of the Metropolitan Life Insurance Company, as is shown in the lower part of the same chart. In this urban and industrial population, the average death rate between 1911 and 1917 was 11.81 per 1,000. The mortality declined .15 deaths per 1,000 per annum during this seven-year period. In the prohibition years, the average death rate was 8.71 per 1,000. But now we see a trend of mortality which is virtually unchanged, the decline be-

CHART XVI

TREND OF MORTALITY, ALL CAUSES OF DEATH, 1900-1920 IN THE U.S. REGISTRATION STATES OF 1900; AND 1911-1926, METROPOLITAN LIFE INSURANCE COMPANY INDUSTRIAL DEPARTMENT



ing only .01 per 1,000, or 1 in a 100,000 per year. This slight change has no significance whatever in view of the short period covered and the marked annual fluctuations of the rate from the average during the period.

How shall we interpret the figures on this chart? The first thing that comes to mind is the fact that the level of mortality in the prohibition years has been clearly lower than in the earlier years, both in the general population and among the insured. In the general population, the average death rate between 1921 and 1926 was 16.9 per cent lower than in the earlier period. Among the Industrial policyholders, the average death rate was 26.2 per cent lower in the prohibition period than in the earlier one. Do these lower average death rates, as some have claimed, measure the effects of the prohibition legislation?

Before such a conclusion can possibly be drawn, it must be remembered that long before the prohibition era we were already enjoying a declining mortality, which was thrown temporarily out of line by the influenza epidemic of 1918. The years 1919 and 1920 brought down the mortality rate to a point lower than it had ever been before, although both years had serious influenza outbreaks in the early months.

The condition since 1921 appears to be merely a continuation of the downward tendency of mortality during pre-prohibition years, but with the improvement retarded among the insured and entirely lost in the general population. And it is noteworthy that during

these same years the death rate in most European countries declined appreciably. Such improvement was not limited to those engaged in the World War, but affected the countries of Europe almost without exception. The years since 1920 have been generally years of good and improving mortality.

The effect of such a movement as prohibition on the death rate would be expected to become cumulative. It would certainly not show its fullest effect at the beginning. According to our figures, the most favorable year of the prohibition period, so far as the mortality of the general population is concerned, was in 1921. Since then the death rate has been rising in the general population and has remained virtually unchanged among the insured. It might be argued that if prohibition were really a vital force in determining better health conditions, its influence would become more pronounced from year to year. This has clearly not happened in the population taken as a whole. If we had only these figures, the most favorable interpretation we could place upon them would be that the prohibition legislation had come into effect at a time of low and declining mortality and that it had had no appreciable effect in still further improving the mortality of our people.

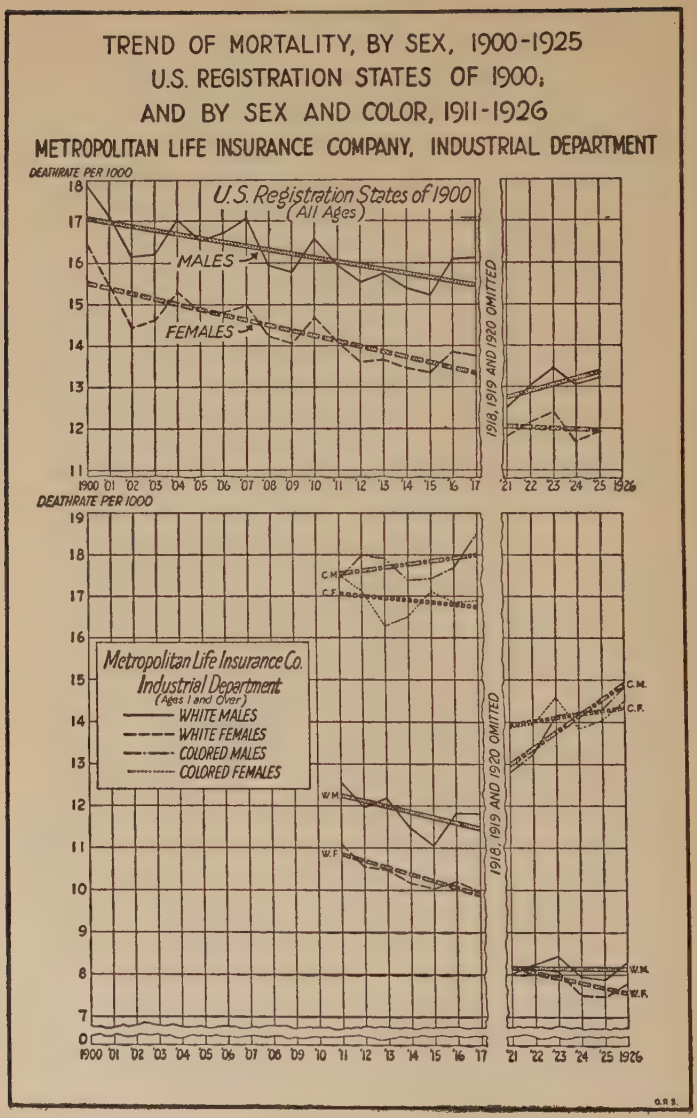
III

But, fortunately, we have secured from the Census Bureau at Washington additional data which, supplementing those on insured lives, make possible a

dissection of the mortality experience of the entire population into several classifications. The first of these is an analysis by sex, and the second by age. It is entirely possible that a negative result such as we have shown in our first chart may be a composite of conflicting tendencies in the several parts which make up the whole. This will be clearer as we proceed with the discussion of the additional material.

The next chart shows the same data as in the first, except that we may now distinguish between the two sexes in the general population and the two sexes for both white and colored persons among the insured. In the upper half of the chart we see a sharp decline in the mortality among both males and females prior to 1917. From 1921 onward there is a marked rise in the death rate among the males and a virtually stationary condition among the females. The slight decline of .03 per 1,000 per annum, in this sex, is of no significance. In the lower half of the chart for the insured lives we find an interesting situation. The colored males show a rapidly mounting rate of mortality in the period between 1921 and 1926; among the colored females, the rate of mortality has likewise risen, but the rate of increase is much less than among the males. Among white persons, on the other hand, the males show a stationary death rate; while white females show a sharply declining death rate during the prohibition period. The actual decline among these white females was .12 per 1,000 per annum, and there can be no question as to the significance of the decline.

CHART XVII

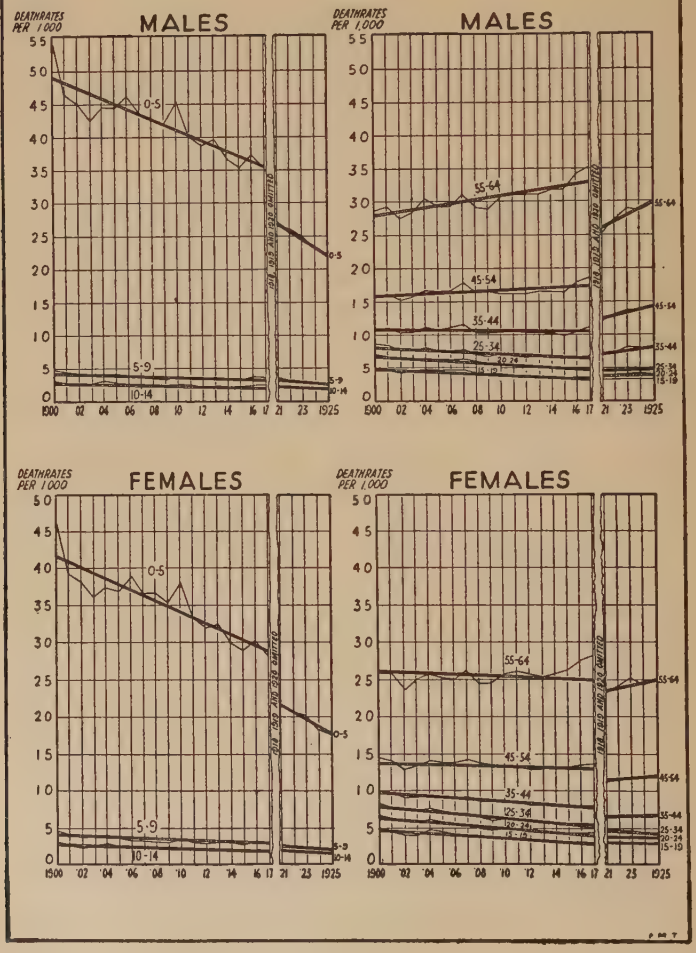

TREND OF MORTALITY, BY SEX, 1900-1925
U.S. REGISTRATION STATES OF 1900;
AND BY SEX AND COLOR, 1911-1926
METROPOLITAN LIFE INSURANCE COMPANY, INDUSTRIAL DEPARTMENT
DEATHRATE PER 1000
U.S. Registration States of 1900
(All Ages)
MALES
FEMALES
1918, 1919 AND 1920 OMITTED
1900 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 21 22 23 24 25 1926
DEATHRATE PER 1000
Metropolitan Life Insurance Co.
Industrial Department
(Ages 1 and Over)
WHITE MALES
WHITE FEMALES
COLORED MALES
COLORED FEMALES
C.M.
C.F.
W.M.
W.F.
1918, 1919 AND 1920 OMITTED
1900 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 21 22 23 24 25 1926

In other words, the improvement in mortality during the period between 1921 and 1926, which was shown in Chart XVI, was entirely limited to the group of white females. In the light of what we saw happen in the general population, we may safely conclude that there has been a different tendency in the mortality of males and of females during the prohibition years and that there has been a real improvement among white females.

Continuing our argument, we may now examine the mortality situation in the several age groups of the general population and among the insured. The facts are clearly shown in Charts XVIII and XIX. The first of these reflects the conditions in the general population of the registration states, the upper half presenting the facts for males, the lower half for females. Concentrating attention on the period 1921 to 1925, inclusive, we find that among males the death rate declined very sharply among children under age five and less sharply in the age periods five to nine and ten to fourteen. The facts are shown in the upper left-hand panel. The age period fifteen to nineteen already shows a stationary condition in the mortality during the prohibition period, and this continues until age thirty-five, after which each one of the age periods shows a rapidly increasing mortality during recent years. In the female sex, as shown in the lower half of the chart, the situation is slightly different. The declines are unmistakable in the early years of life and continue up to age thirty-five. It is only after age

CHART XVIII

TREND OF MORTALITY, 1900-1925 BY SEX AND AGE
IN THE U.S. REGISTRATION STATES OF 1900



thirty-five that the mortality decline among females is either retarded or is actually converted into a rising tendency.

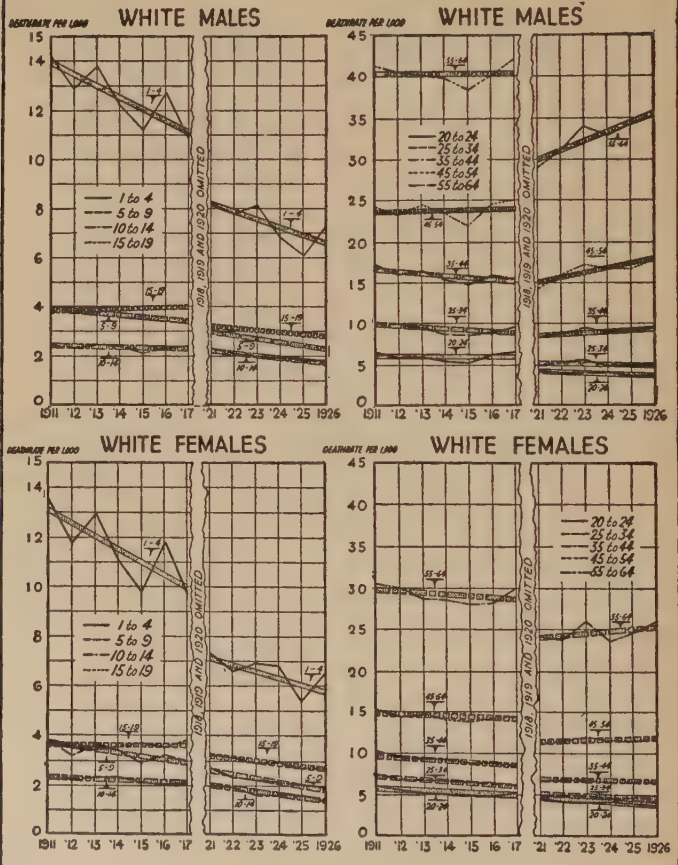
Among the insured of the Metropolitan Life Insurance Company virtually the same situation appears as is indicated on Chart XIX. The facts for the males are shown in the upper half of the chart; those for the females in the lower half. The decline among males from 1921 to 1926 is very sharp at the ages one to four. It is less marked but significant in the age periods five to nine, ten to fourteen, and fifteen to nineteen. The age period twenty to twenty-four shows a slight decline. The period twenty-five to thirty-four shows no change. From age thirty-five onward the death rates show a rising tendency during these prohibition years, and this becomes very marked at the advanced ages. Among the females, the declines are just as sharp in the early age periods—that is, up to age twenty. But unlike the males, the declines continue during the age periods twenty to twenty-four and twenty-five to thirty-four. The rates remain virtually unchanged in the age period thirty-five to forty-four. The years forty-five to fifty-four show an insignificant rising tendency and only the age period fifty-five to sixty-four shows a rise in the death rate.

IV

We have, therefore, for the first time succeeded in converting a flat and negative composite into a rather interesting series of tendencies in the several com-

CHART XIX

TREND OF MORTALITY, 1911-1926
WHITE PERSONS, BY SEX AND AGE
METROPOLITAN LIFE INSURANCE COMPANY, INDUSTRIAL DEPARTMENT



ponent groups of the population which may help us to answer the question we have for discussion. For one thing, there is now much more agreement in the results of this two-sided investigation. We may summarize our findings as follows: That the prohibition period is characterized by sharply declining mortality rates among children and adolescents of both sexes, and that this decline is characteristic of a number of additional age periods among women. The improvement is retarded among young male adults and disappears altogether during the middle years of life in that sex. In fact, the mortality has definitely risen among men, after age thirty-five. All together, we may safely say that over half of the total population has experienced a very favorable mortality during recent years. One might even go a bit further and say that the facts are consistent with an assumption that the conditions of life during the period of the new legislation have been beneficial to this large part of the public. A little arithmetic will show that there has been a saving each year of about 14,500 children under age five, another 2,000 each year between ages five and ten, and another 1,000 between ages ten and twenty. This makes a total of approximately 17,500 young lives a year.

No one would assume that this gain was entirely the result of the new legislation, for reasons we have already given. Many causes have undoubtedly operated to bring this favorable condition about. What these are will be made clearer if we examine into the

diseases and conditions which have declined among women and children during the six-year interval since prohibition came into effect. At the children's ages, the greatest improvement in the death rate has taken place from accidents, from diarrhœal disease and from pneumonia. Infectious diseases have likewise declined considerably. Among young women, the improvement we spoke of is traceable somewhat to a decline in tuberculosis. There has also been a sharp decrease in the mortality from puerperal causes. It would appear, therefore, that the improvement is a response, in some measure, to the direct attack made by health and social-service agencies both public and private which has been going on for years against the communicable diseases and against the diarrhœal diseases of children. But, in addition, it may be considered a reaction to a rising standard of living, and this is especially evidenced by the lower tuberculosis and the lower pneumonia rates. The whole picture is consistent with and may well be expected to have arisen (to an appreciable degree) from better conditions within the home, such as more and better food, better medical service, and better housing. It is impossible to measure or to say how far any one factor has operated in the direction of reducing mortality. The increased facilities of public-health work and the better conditions within the home have operated together to produce the end result, and it would be entirely unfair to over-emphasize the effect of one of these forces as against the other. In fact, these two activities work best hand in hand

and add to each other's effectiveness. While we may say that the death rate of children and of young women —that is, those who remain at home for the most part —would probably have gone down without prohibition, it would be too much to assume that the conditions within the home during the prohibition years had not been instrumental in furthering the decline. The conditions of domestic life during the last few years have been such as to add incentive and power to the forces already at work to make for better health and longer life in these divisions of the population.

Evidence toward this conclusion, which is presented very tentatively, is afforded by the observations of the army of social workers, insurance agents, and business men who from one end of the country to the other are virtually in accord that the years since 1920 have seen an improvement in the economic condition of the homes of the great mass of American people. Never before have savings deposits been so great or have life insurance policies been added to and maintained as during the last six years. Retail trade has never experienced such prosperity. All of this emphasizes what is universally observed, namely, that the housewife now has more money to spend on the necessities of the household, on food, on clothing, and on shelter to a degree that has never before been possible for so many. It has been suggested that that part of the wages which under the old régime went into the liquor traffic is now largely diverted into channels which mean increased protection and welfare for the family. But

this phase of the subject is unfortunately beclouded with much uncertainty. We know very little that is accurate with reference to the amount of alcohol now being consumed, what is being spent for it, and least of all how the facts shape up for the various economic levels of the population.

V

How, then, does our assumption with regard to women and children tie up with the facts we have given for the condition among men? Why have the death rates for men increased in view of these favorable changes? In that sex, we find that an improvement in tuberculosis has gone hand in hand with an increase in the mortality from pneumonia, from accidents, from heart disease and from kidney disease. During this period there has been a constant rise in the death rate from alcoholism and from the associated condition of cirrhosis of the liver. Both of these diseases were at a minimum in 1920. They are now at a point almost as high as in the decade prior to prohibition. The condition we have found to exist in the mortality of adult men in the United States is entirely consistent with the observations universally confirmed of a continued widespread indulgence in alcoholic beverages by men. Prohibition has not been particularly effective in that sex and especially has this been true in the cities and, more particularly, in the Eastern states. If the saloon has gone and the great body of men no

longer spend a large part of their wages on liquor, it is only too clear that what they do drink now, even if in smaller quantities and at a lesser total cost, is of such a deleterious character as to result in no advantage to their health. The quality of liquor used throughout the country is sufficiently bad to make up for the smaller quantity consumed. The economic gains help us to understand the condition among women and children; the character of the present supply of liquor helps us to understand the lack of improvement which appears in the mortality of men.

There can be little question as to the unsatisfactory situation now confronting large areas of the country as regards the use of alcohol by men. Beginning with 1920, there has been a continuous and marked rise in the number of deaths resulting from the use of alcohol. In 1920 the death rate from this condition reached its minimum, namely, 1.3 per 100,000. Every year since then, virtually with no exception, has seen a rise, and the rate is now more than three times as high as it was only six years ago. The same condition is found to exist among the industrial classes as among those of larger incomes whose insurances are carried in the Ordinary Departments of the insurance companies. The insurance results are confirmed by the population figures for the several states and this phenomenon is widely observed, larger states showing more strikingly what can be found in the smaller ones with a little more searching. In Maryland, the alcoholism death rate in 1926 was the highest ever re-

corded since 1911. In Rhode Island, Michigan, and New York the 1926 rate was the highest with a few exceptions. The records of hospitals for the insane tell a similar story. The year 1920 showed the lowest rate for admissions to hospitals for mental disease on account of alcoholism. Since that year the admission rate has increased step by step, and last year saw conditions three times as bad as six years ago. It is only too true that, in the country over, with very few exceptions there is a mounting rate from alcoholism and from the associated diseases among the male population.

This situation is in striking contrast with what has occurred in neighboring Canada. In the Dominion, likewise, several provinces have been experimenting with one form or another of regulatory legislation. But in that country there is as yet no evidence whatever of any untoward result in the mortality rates for any large group of the population. The experience of the Metropolitan Life Insurance Company in Canada is especially instructive. Among over a million policyholders, there have been recorded only a hundred deaths from alcoholism and acute alcoholic poisoning during the entire period, 1911 to 1926. On the annual basis, the number of deaths from these causes among Canadian policyholders is so small as to be almost negligible. The death rate from these causes, in fact, is only about a quarter of what it has been among insured lives in the United States. But what is even more interesting is the fact that the deaths from alcoholism have gone down during the last ten

years in Canada—a condition very different from that in the United States. In so far as death rates are a reliable indication, the Canadians seem to have succeeded much better than we in their efforts to control the problem of alcohol and of alcoholism.

But there must be no misunderstanding of the true import of these findings. The death rate from alcoholism alone is not high. Deaths from alcoholism and from alcoholic insanity are only a small part of the total. These figures are important not so much on their own account, but rather as indications of a condition or habit of life which now prevails. Much more important than the deaths from alcohol are the deaths from the degenerative conditions such as heart diseases, kidney disease, and pneumonia, which are apparently on the rise. Just how far the indulgence in alcohol will explain these increases it is impossible to say. But in any case there is no indication as yet of a tendency toward improvement in them among American men.

VI

The effect of the prohibition legislation on the public health has clearly not been uniform among the various groups of the American population. This fact probably explains much of the confusion which has existed in the public mind with respect to the influence of prohibition. Many persons have thought of prohibition as if it were a definite and unvarying condition. The facts are very different. Absolute pro-

hibition prevails hardly anywhere and affects as yet only small numbers of people. We must learn to think of the force of prohibition as varying to a greater or less degree with geographical areas, with economic strata, and with the sex and age classes of the population. It is only when considered in this light that we can hope to obtain a consistent answer to our initial question. We may then say that the effect of the prohibition situation on the public health has probably been good where there has been prohibition to an appreciable degree, and the situation has been unsatisfactory to the degree in which there has in fact been no prohibition. Especially is this true in those areas of the country and among those classes of the people where there has been drinking of the highly deleterious stuff that passes for alcoholic beverages these days. Such a conclusion is at once consistent with the facts at our disposal and squares with what has generally been accepted as the true relation existing between heavy alcoholic indulgence and individual health.

This conclusion must not be interpreted, however, as an indorsement of the Eighteenth Amendment and of the current enforcement law. This paper is not concerned with the desirability of this type of legislation. Our main purpose has been to discover the facts with regard to the health of our people during recent years. We have disclosed, we believe, certain conditions which throw light on the current situation. If it were desired fully to evaluate the prohibition legislation, it would be necessary, in addition to these facts

on health, to consider other items of equal importance in the life of the nation, each one of which would require careful study. The effect of the recent legislation on public honesty, on respect for law, on the integrity of public officials and other considerations, will have to be considered with great care. Much time must elapse before these important questions can be considered adequately in the light of the new legislation. This is not the time nor the place for such a discussion.

CHAPTER XV

THE POSSIBILITY OF EXTENDING HUMAN LIFE[1]

THE subject which I am to consider has been a favorite one for speculation from the earliest antiquity up to our own time. The poets, prophets and philosophers have all been concerned with it. But, unfortunately, they have approached the subject with a bias. They have permitted their personal desire for extended life to determine their thought. In our own time, Shaw has given dramatic treatment to the subject, but he has approached it like the rest and has assumed that mere wishing can be converted into actual accomplishment. You and I will not approach the subject from that angle. We are concerned primarily with the facts. We are more fortunate than our predecessors. We have a body of knowledge which they lacked and, what is more important, a scientific method of analysis. We shall not say arbitrarily with the Psalmist, "The days of our years are threescore and ten." We shall rather ask and attempt to answer a series of questions such as: "What are the conditions of health and mortality which determine the life span?" "What is the present duration of human

[1] An address presented to the Harvey Society of New York, December, 1922, and printed in *Metron,* September, 1923.

life?" "How does that vary from place to place and from group to group?" "How much has it increased in various periods of time and what elements have led to the increase?" Finally, "How much more is there still ahead of us?" In such an approach, I hope there will be no room for dogmatism and no pretense to finality. We shall be humble seekers for the truth wherever that may lead us.

II

Obviously, the first step in our discussion is to discover a yardstick or measure of the human life span. No scientific discussion of the subject is possible without that. The first measure we have is one with which you are familiar, namely, the death rate. For example, the death rate of New York City in the year 1926 was 12.80 per 1,000. This means that there occurred in that year approximately 13 deaths for each 1,000 of the population, or 128 deaths per 10,000 of the population, or, as we sometimes say, 1,280 deaths per 100,000 of the population. This figure is obviously a rough measure and tells us little or nothing with regard to the longevity of the people of the city. We immediately get into difficulties with this rate when we begin to compare the mortality of New York City with that, say, of Seattle, Washington, where the rate is lower. The fact is that the populations of New York City and Seattle are not constituted exactly alike as to the proportion of young and old people, and in other respects. If, for example, there are more babies

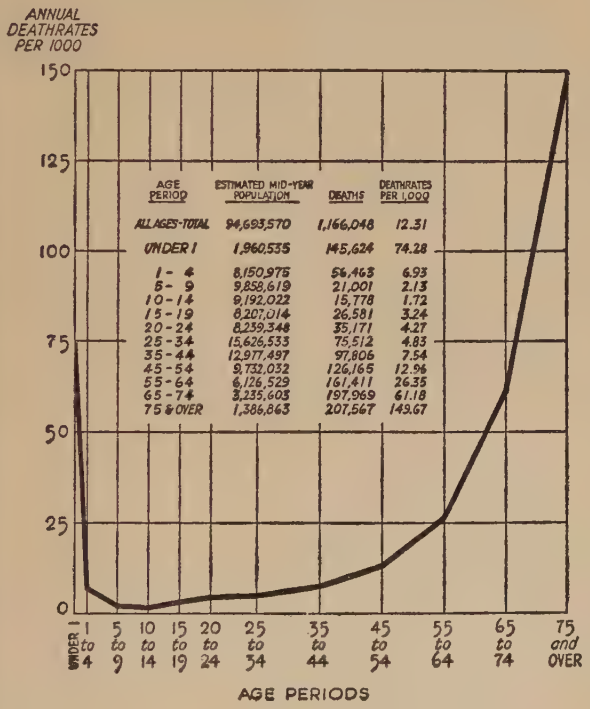
and more old folks proportionately in New York City than there are in Seattle, that alone will materially increase the total death rate of New York City because it is among the babies and old people that mortality is heavy. This is universally recognized and, instead of the crude death rate for the whole population, we proceed to prepare death rates for specific age divisions of the population as well as for the whole. There is, for example, the death rate in the first year of life. We calculate, also, the death rates for the period of preschool life, for other ages of childhood, for the broad span of early adult life, then of middle life and of old age. These values give us a measure of mortality for each age division of life and these may be compared for various places. The finer the subdivision of age, the more precise the comparison of mortality becomes.

Let me show you, for example, how a table of specific death rates looks for a large population, such as a group of states called the registration states in the year 1926 (see Chart XX). When the series of rates is plotted on cross-section paper and a fairly smooth line is passed through the points, a characteristic hook-shaped curve is produced, such as is shown in the chart.

This chart gives a very good picture of mortality conditions prevailing in the registration states at the present time. But there are many items to keep in mind, and they increase in number as our table becomes more precise for the age periods. It is difficult to compare the many items of one locality with those of another; some may be higher and others lower, pro-

RATES OF MORTALITY IN 1926

United States Registration States as constituted in 1920



AGE PERIOD	ESTIMATED MID-YEAR POPULATION	DEATHS	DEATHRATES PER 1,000
ALL AGES-TOTAL	94,693,570	1,166,048	12.31
UNDER 1	1,960,535	145,624	74.28
1 - 4	8,150,975	56,463	6.93
5 - 9	9,858,619	21,001	2.13
10 - 14	9,192,022	15,778	1.72
15 - 19	8,207,014	26,581	3.24
20 - 24	8,239,348	35,171	4.27
25 - 34	15,626,533	75,512	4.83
35 - 44	12,977,497	97,806	7.54
45 - 54	9,732,032	126,165	12.96
55 - 64	6,126,529	161,411	26.35
65 - 74	3,235,603	197,969	61.18
75 & OVER	1,386,863	207,567	149.67

ducing a confused picture of the whole. A more important defect is that the death rates, as such, throw no direct light on the fact of longevity which is, after all, what the public wants to know about. The technical concept of the death rate needs to be converted into another measure which the average man can understand and use. This need has led to the production of another table which converts the multitude of specific death rates for a given area into the number of deaths in each age interval among a stationary population of 100,000 and then into the average length of after-lifetime at each age and in particular at birth. The "Life Table" does this.

Let me show you, for example, a life table of the whole population of the same group of states reflecting the conditions of mortality which prevailed in the year 1926. (See Table 11 on pages 315-318.) Notice that we begin with 100,000 individuals from their moment of birth and that we trace their decline, in number, from year to year until all have disappeared by death. The table is, therefore, an epitome of the life cycle of this group of 100,000 individuals. The second column shows the number of survivors at the beginning of each year of age; the third column shows the number that died at each year of age; the fourth column gives the rate of mortality in each year of age. These are the death rates we considered previously; but they are now given for each year of age. They are the basic facts from which all the other figures follow.

TABLE 11

Life Table, 1926

United States Registration States, Total Persons*

(1) Age Interval	(2) Number alive at beginning of age interval	(3) Number dying in age interval	(4) Mortality rate per 1,000	(5) Total population living in current and higher age intervals	(6) Complete expectation of life
0–1	100,000	6,190	61.90	5,773,502	57.74
1–2	93,810	1,247	13.30	5,676,598	60.51
2–3	92,563	568	6.14	5,583,411	60.32
3–4	91,994	376	4.09	5,491,133	59.69
4–5	91,618	294	3.21	5,399,327	58.94
5–6	91,324	251	2.75	5,307,855	58.12
6–7	91,073	219	2.41	5,216,656	57.28
7–8	90,854	193	2.13	5,125,693	56.42
8–9	90,661	161	1.78	5,034,936	55.54
9–10	90,500	143	1.59	4,944,355	54.63
10–11	90,356	137	1.52	4,853,927	53.72
11–12	90,219	140	1.55	4,763,640	52.80
12–13	90,103	148	1.64	4,673,479	51.87
13–14	89,955	165	1.84	4,583,450	50.95
14–15	89,790	194	2.16	4,493,577	50.05
15–16	89,596	229	2.55	4,403,884	49.15
16–17	89,367	263	2.94	4,314,403	48.28
17–18	89,104	290	3.26	4,225,168	47.42
18–19	88,813	313	3.52	4,136,209	46.57
19–20	88,501	333	3.76	4,047,552	45.73
20–21	88,168	350	3.97	3,959,218	44.91
21–22	87,818	365	4.15	3,871,225	44.08
22–23	87,453	375	4.29	3,783,590	43.26
23–24	87,077	380	4.36	3,696,325	42.45
24–25	86,698	379	4.37	3,609,437	41.63
25–26	86,319	376	4.35	3,522,929	40.81
26–27	85,943	374	4.35	3,436,798	39.99
27–28	85,570	377	4.40	3,351,042	39.16
28–29	85,193	385	4.52	3,265,660	38.33
29–30	84,808	396	4.67	3,180,660	37.50
30–31	84,412	409	4.84	3,096,049	36.68
31–32	84,004	423	5.04	3,011,841	35.85

* As constituted in 1920.

TABLE 11 (*Continued*)

(1) Age Interval	(2) Number alive at beginning of age interval	(3) Number dying in age interval	(4) Mortality rate per 1,000	(5) Total population living in current and higher age intervals	(6) Complete expectation of life
32–33	83,580	438	5.25	2,928,049	35.03
33–34	83,142	454	5.45	2,844,688	34.21
34–35	82,688	469	5.67	2,761,773	33.40
35–36	82,219	486	5.91	2,679,319	32.59
36–37	81,733	506	6.19	2,597,343	31.78
37–38	81,228	528	6.50	2,515,862	30.97
38–39	80,700	556	6.89	2,434,898	30.17
39–40	80,144	587	7.32	2,354,476	29.38
40–41	79,557	620	7.79	2,274,626	28.59
41–42	78,937	653	8.27	2,195,379	27.81
42–43	78,284	683	8.72	2,116,769	27.04
43–44	77,601	708	9.12	2,038,826	26.27
44–45	76,893	729	9.48	1,961,579	25.51
45–46	76,164	751	9.86	1,885,051	24.75
46–47	75,413	777	10.30	1,809,263	23.99
47–48	74,637	811	10.87	1,734,238	23.24
48–49	73,826	853	11.55	1,660,006	22.49
49–50	72,973	899	12.33	1,586,606	21.74
50–51	72,074	951	13.19	1,514,082	21.01
51–52	71,123	1,007	14.16	1,442,484	20.28
52–53	70,117	1,068	15.23	1,371,864	19.57
53–54	69,050	1,135	16.43	1,302,280	18.86
54–55	67,915	1,207	17.78	1,233,798	18.17
55–56	66,708	1,282	19.22	1,166,486	17.49
56–57	65,426	1,356	20.72	1,100,419	16.82
57–58	64,068	1,425	22.24	1,035,672	16.17
58–59	62,643	1,481	23.63	972,316	15.52
59–60	61,163	1,524	24.92	910,413	14.89
60–61	59,639	1,570	26.33	850,013	14.25
61–62	58,069	1,631	28.08	791,159	13.62
62–63	56,457	1,718	30.44	733,896	13.00
63–64	54,738	1,840	33.62	678,299	12.39
64–65	52,898	1,985	37.53	624,481	11.81
65–66	50,913	2,133	41.90	572,575	11.25
66–67	48,780	2,265	46.44	522,728	10.72

TABLE 11 (*Continued*)

(1) Age Interval	(2) Number alive at beginning of age interval	(3) Number dying in age interval	(4) Mortality rate per 1,000	(5) Total population living in current and higher age intervals	(6) Complete expectation of life
67–68	46,493	2,364	50.84	475,092	10.22
68–69	44,129	2,424	54.92	429,781	9.74
69–70	41,705	2,457	58.91	386,864	9.28
70–71	39,249	2,472	62.98	346,387	8.83
71–72	36,777	2,477	67.36	308,374	8.39
72–73	34,317	2,481	72.29	272,828	7.95
73–74	31,836	2,474	77.70	239,751	7.53
74–75	29,362	2,451	83.48	209,153	7.12
75–76	26,911	2,417	89.80	181,016	6.73
76–77	24,494	2,374	96.91	155,313	6.34
77–78	22,145	2,326	105.04	131,994	5.96
78–79	19,818	2,274	114.76	111,013	5.6
79–80	17,544	2,213	126.13	92,331	5.3
80–81	15,331	2,125	138.59	75,894	5.0
81–82	13,206	2,000	151.46	61,625	4.7
82–83	11,177	1,832	163.89	49,433	4.4
83–84	9,345	1,640	175.51	39,173	4.2
84–85	7,705	1,439	186.78	30,648	4.0
85–86	6,266	1,241	197.99	23,663	3.8
86–87	5,025	1,053	209.49	18,018	3.6
87–88	3,978	882	221.69	13,516	3.4
88–89	3,096	727	234.78	9,979	3.2
89–90	2,369	589	248.54	7,246	3.1
90–91	1,780	468	262.76	5,171	2.9
91–92	1,313	364	277.21	3,625	2.8
92–93	948	276	291.60	2,495	2.6
93–94	671	205	305.76	1,685	2.5
94–95	466	149	319.82	1,116	2.4
95–96	317	106	333.92	725	2.3
96–97	211	74	348.26	461	2.2
97–98	137	50	363.03	287	2.1
98–99	87	33	378.00	175	2.0
99–100	54	21	392.98	104	1.9
100–101	33	13	408.38	60	1.8
101–102	20	8	424.65	34	1.7

TABLE 11 (*Continued*)

(1) Age Interval	(2) Number alive at beginning of age interval	(3) Number dying in age interval	(4) Mortality rate per 1,000	(5) Total population living in current and higher age intervals	(6) Complete expectation of life
102–103	11	5	442.29	19	1.7
103–104	6	3	461.42	10	1.6
104–105	3	2	481.85	5	1.5
105–106	2	1	504.61	3	1.4
106–107	1	0	526.79	1	1.

In 1926, the mortality in the first year of life in this group of states was 61.9 per 1,000 births. If we apply this infant mortality rate to 100,000 births, there will be 6,190 deaths in the first year of life. There will, therefore, be 93,810 survivors at the beginning of the second year. The actual rate of mortality of the second year of life is applied to this number and a total of 1,247 decedents results. There are left, 92,563 survivors to begin the third year. In the same way, the application of the actual mortality rate to each succeeding number of survivors, at each age, gives the mortality history of the entire group until all have passed away. The important point to remember is that we begin with the mortality rate prevailing at the successive ages in any one year of time and apply it to our population of 100,000 at birth and to the survivors at each succeeding age until all are accounted for.

Let us now examine this table at the other end of life. It will be seen that there are thirty-three persons who celebrate their one hundredth birthday. Notice that these thirty-three people will altogether live a sum of sixty years before they all pass away. This figure is shown in the fifth column. This fifth column shows the number of years of life which the persons at any age will survive before all have passed out. So, by working the table backward, we find that, at the moment of birth, our group of 100,000 people have ahead of them a total of 5,773,502 years, which is, of course, an average of 57.74 years for each one of them. That is how the average length of life at birth, or what we usually call the Expectation of Life, is obtained. It is this figure which we use as the best index of the life span. Remember that this entire structure is based on Column 4—that is, the rate of mortality per 1,000 which prevails in the calendar year for which the table is made. All of the other columns follow from Column 4. The life table is not as complex as it appears to be.

This method of measuring the life span is essentially accurate, is simple in construction, once the graduated rates of mortality are obtained, and produces figures for various places and various groups of people which are comparable. It is usually difficult to compare the health conditions of different countries or even of different cities in the same country by comparing their death rates, because of the varieties of age constitution

of the people in the several places or because of so many other conditioning factors which affect the death rates. The life table irons out these differences. It applies the actual facts of mortality for the whole span of life and, later, gives the resulting values of expected longevity for the average individual of the group.

III

With this as a background, let us become familiar with some of the very obvious facts of longevity at the present time. First, observe that the expectation of life at birth was 57.74 years in 1926 for all persons. The maximum expectation occurs in the second year when it is 60.51 years; that is because the child of one year has already overcome the heavy initial mortality in the first year of life. Even at age five, the expectation is greater than at birth and for the same reason. But, from this age onward, the expectation declines regularly with every advancing year of life. At twenty-five, the expectation for all persons in 1926 was 40.8 years; at forty, 28.6 years; at fifty, 21 years. That means that persons surviving to age fifty may, on the average, expect to survive to age 71. Some, of course, will die in their fiftieth year and some may be centenarians. That, I hope, is clear. But, the average individual at fifty, if we may conjure up such an imaginary person, may, with reason, expect to live to age seventy-one, or, as we put it, the average length of life remaining to each one of the survivors at age

fifty, is 21 more years. Even at seventy, there are still about 9 years of expectation, and so on in a diminishing degree to the end.

The table we have been considering is for both sexes combined. Now sex is a very important element in mortality. You know that the mortality of women is less than that of men. Their expectation of life is, therefore, greater. The life table for the two sexes tells us how much greater. The following table, and Chart XXI on page 322, show the facts for the United States registration states in 1926, at selected ages, for males on the one hand, and for females on the other. The females have an expectation at birth two and one-half years greater than males; at thirty, it is one and one-half years greater; at fifty, it is about a year greater; and, at seventy, over one-half year greater.

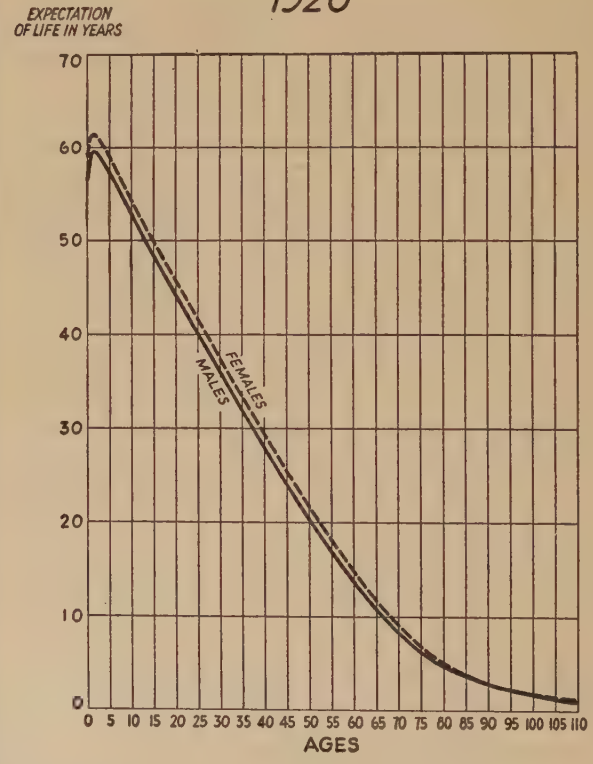
TABLE 12

Complete Expectation of Life at Specified Ages
Males and Females in United States Registration States, 1926

Age	Males	Females	Age	Males	Females
0	56.51	59.09	30	35.94	37.53
1	59.65	61.48	40	27.87	29.43
2	59.50	61.25	50	20.39	21.70
3	58.88	60.60	60	13.75	14.73
4	58.14	59.83	70	8.49	9.17
5	57.33	59.01	80	4.84	5.15
10	52.93	54.51	90	2.84	2.84
20	44.22	45.72	100	1.73	1.83

The following table shows how the duration of life

EXPECTATION OF LIFE
AT SPECIFIED AGES
*United States Registration States.**
1926



*(OF 1920)

varies from place to place in the civilized world, reflecting the varieties of health standards and of well-being prevailing in the various countries:

TABLE 13

Complete Expectation of Life at Specified Ages
Various Countries in Recent Years

Country	Year	Males				Females			
		0	30	50	70	0	30	50	70
Australia	1920–22	59.16	38.43	22.18	9.24	63.29	41.44	24.86	10.36
Denmark	1921–25	60.30	40.80	23.70	9.80	61.90	40.80	24.10	10.00
England	1920–22	55.62	37.40	21.36	8.75	59.58	40.26	23.69	9.95
France	1908–13	48.50	34.03	19.69	8.00	52.42	37.37	22.13	8.95
Germany	1910–11	47.41	35.29	19.71	7.90	50.68	37.30	21.45	8.35
Holland	1910–20	55.10	38.80	22.40	9.10	57.10	39.50	23.40	9.60
India	1901–10	22.59	22.44	13.97	6.17	23.31	22.99	14.28	6.22
Italy	1910–12	46.97	36.73	—	—	47.79	37.33	—	—
Japan	1908–13	44.25	34.31	19.61	8.26	44.73	35.72	21.84	9.28
New Zealand	1921–22	62.76	39.98	23.51	9.91	65.43	41.76	24.91	10.57
Norway	1911–20	55.62	38.83	24.10	10.40	58.71	40.35	25.78	10.15
Sweden	1911–20	55.60	38.57	23.35	9.88	58.38	40.18	24.79	10.53
Switzerland	1920–21	54.48	35.56	19.89	8.01	57.50	37.79	21.70	8.39
United States	1919–20	55.33	37.14	22.00	9.43	57.52	38.25	22.93	9.89

New Zealand shows the greatest expectation of any of the countries listed in the above table. For males in 1921-22 the complete expectation was sixty-two and eight-tenths years at birth, as compared with fifty-five and three-tenths years in the United States, 1919-20. The figure for females in New Zealand deserves special quotation, as it represents a gratifying record. *On an average* New Zealand women, according to conditions in 1921-22, live to the ripe age of sixty-five and four-tenths years. The figures for Den-

mark (1921-25) and Australia (1920-22), which are very much alike, follow next in order of excellence.

It will be seen from the table that the expectation of life in England and Wales for the year 1921 was very nearly the same as in the United States for the year 1919-20. Very similar figures are also shown for the Scandinavian countries, Sweden and Norway, but the comparison cannot be made on the basis of the same calendar years, owing to differences in the times for which data are available. The figures for these countries relate to the year 1915, whereas our comparable data relate to 1919-20. Thus the Scandinavian countries had reached the same advance in expectation of life as our own country, but five years earlier than we.

Germany and Italy had in 1910 an expectation at birth about three years better than Japan. France, in the same year, exceeded the figure for Germany by one year. In India the life span is only about one-half of what it is in European countries. The important point to remember is the great diversity in the span of life in the various countries, ranging from 65.4 years for females in New Zealand to 22.6 years for males in India. You will realize why these differences occur in the light of the sanitary, social, and economic conditions that prevail in the various parts of the world. You will understand also why the people of some countries enjoy great prosperity and a large measure of well-being, while those in others are always near or under the line of distress and general misery.

EXPECTATION OF LIFE AT BIRTH
IN VARIOUS COUNTRIES

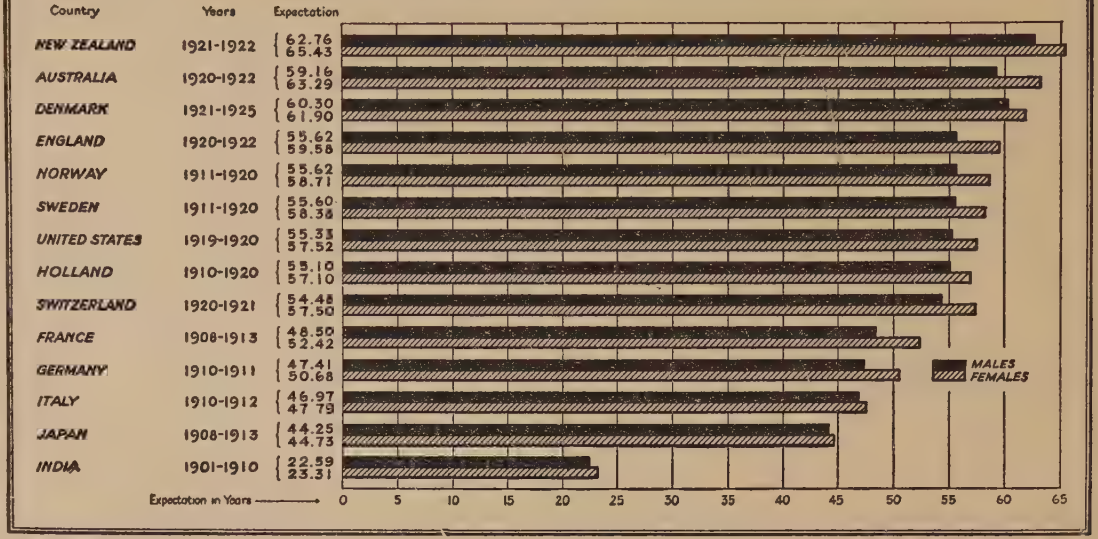


CHART XXII

IV

A substantial increase in the life expectation has occurred in the last century (see table on page 327). This fact is the best indication we have of the much improved material progress of the great mass of people in the civilized countries of the world. The figures for England and Wales are the most instructive for our purposes. The first life table for the population of that country described the period between 1838 and 1854. The average length of life was then nearly forty-one years. A series of life tables followed the first and show a successive gain from decade to decade. The latest table, that for 1920 to 1922, gives an average expectation of nearly fifty-seven years. There has, therefore, been a gain of sixteen years in the interval of eight decades. On the Continent, the best historical data are for Denmark. A table for the years 1835 to 1844 shows an expectation of forty-three and one-half years. The last table (1921 to 1925) gives sixty-one years. This is a gain of seventeen and a half years in the interval of eight decades. In our own country, the first table of any value is for Massachusetts (1855). The values agreed essentially with those for England and Wales for the corresponding period, the life expectation in both Massachusetts and in England and Wales being about forty years. In 1910, the Massachusetts figure had increased to fifty-one years, showing a gain of eleven years in the half century. In 1920, the figure was over fifty-five years,

INCREASE IN LIFE EXPECTATION

TABLE 14

Expectation of Life at Birth

Principal Countries or States at Various Times

Country—Year	Expectation at Birth	Country—Year	Expectation at Birth
ENGLAND AND WALES		SWITZERLAND	
1838–1854	40.88	1876–1881	41.90
1871–1880	42.98	1881–1888	44.49
1876–1880	43.56	1889–1900	47.10
1881–1890	45.42	1901–1910	50.70
1891–1900	45.95	1920–1921	55.99
1901–1910	50.45		
1910–1912	53.42	SWEDEN	
1920–1922	56.95	1816–1840	41.53
		1841–1845	44.27
SCOTLAND		1846–1850	43.48
1861–1870	42.09	1851–1855	42.57
1871–1880	42.37	1856–1860	42.31
1881–1890	45.12	1861–1870	44.60
1891–1900	46.06	1871–1880	46.95
1911	51.64	1881–1890	50.01
1921	54.71	1891–1900	52.28
		1901–1910	55.75
FRANCE		1911–1920	56.99
1817–1831	39.55		
1840–1859	40.15	HOLLAND	
1861–1865	39.82	1850–1859	37.32
1877–1881	42.12	1870–1879	39.55
1898–1903	47.43	1880–1889	43.75
1908–1913	50.46	1890–1899	47.60
		1900–1909	52.20
ITALY		1910–1920	56.10
1876–1887	35.25		
1899–1902	43.04	NORWAY	
1901–1910	44.53	1856–1865	48.67
1910–1912	47.38	1871–1880	49.81
		1881–1890	49.97
BELGIUM		1891–1900	52.27
1881–1890	45.11	1901–1910	56.26
1891–1900	47.10	1911–1920	57.16

TABLE 14 (*Continued*)

Country—Year	Expectation at Birth	Country—Year	Expectation at Birth
DENMARK		PRUSSIA	
1835–1844	43.65	1867–1877	36.68
1860–1869	44.55	1890–1891	40.60
1880–1889	47.85	1891–1900	42.83
1885–1894	48.05	1900–1901	43.95
1895–1900	51.70	1906–1910	48.22
1906–1910	56.40		
1916–1920	56.95	BAVARIA	
1921–1925	61.10	1891–1900	39.48
		1901–1910	43.78
FINLAND			
1881–1890	42.80	SAXONY	
1891–1900	44.25	1891–1900	39.80
1901–1910	46.30	1900–1911	44.77
1911–1920	46.26		
		INDIA	
GERMANY		1881–1891	25.07
1871–1880	37.01	1891–1901	23.80
1881–1890	38.71	1901–1911	22.95
1891–1900	42.26		
1901–1910	46.57		
1910–1911	49.04		
UNITED STATES (orig. reg. states) 1901	49.24	MASSACHUSETTS	
1910 (orig. reg. states)	51.49	1855	39.77
1920 white (orig. reg. states)	55.16	1890	43.48
1920 white (total reg. states)	56.32	1895	45.35
1926 (total reg. states)	57.74	1901	47.75
		1910	51.19
		1920	55.25

or a gain of more than fifteen years in sixty-five calendar years. In the original registration states of the United States we find an increase of six years between 1901 and 1920.

There is another and perhaps better way to see how

great has been the improvement in the life span in the last century or so. That is, to observe the age at which the original number of our life-table population, 100,000, is reduced by one-quarter, one-half and three-quarters. The following table and Chart XXIII on page 330 show the facts for England at the time of the first and last tables and for New Zealand at the time of its last table.

TABLE 15

Country	Date of Life Table	Age in which the original number of a generation is reduced by—					
		One-fourth		One-half		Three-fourths	
		Males	Females	Males	Females	Males	Females
England....	1838–1854	3.25	5.00	44.33	46.33	68.17	70.08
	1920–1922	42.39	48.81	65.13	69.25	75.83	79.00
New Zealand	1921–1922	54.35	57.67	70.15	72.75	79.50	81.22

The same life tables also lend themselves to another interpretation. In England, at the time of the first table, only 29.5 per cent of the male and 32.4 per cent of the female population attained age sixty-five, whereas at the time of the last table 50.3 per cent of the males and 58.0 per cent of the females attained that age. In New Zealand, where the best longevity conditions prevail, 60.9 per cent of males and 65.9 per cent of females reached the age of sixty-five in the period 1921 to 1922. As this is the age which closes

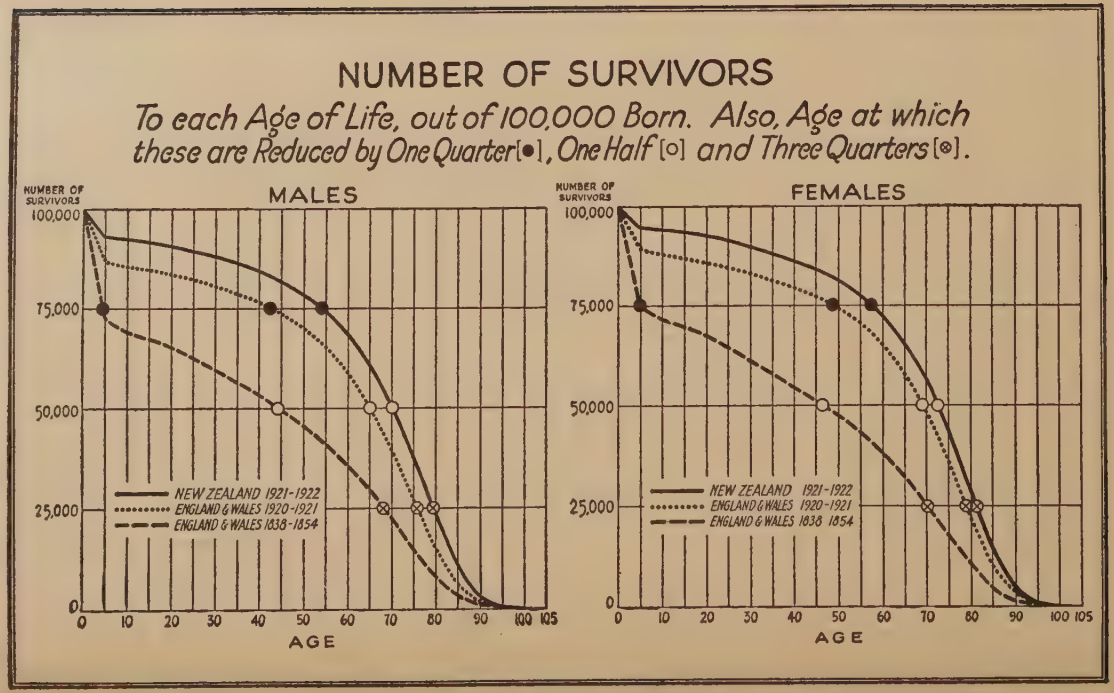

NUMBER OF SURVIVORS
To each Age of Life, out of 100,000 Born. Also, Age at which these are Reduced by One Quarter [•], One Half [○] and Three Quarters [⊗].
MALES
FEMALES
NUMBER OF SURVIVORS
100,000
75,000
50,000
25,000
0
0 10 20 30 40 50 60 70 80 90 100 105
AGE
NEW ZEALAND 1921-1922
ENGLAND & WALES 1920-1921
ENGLAND & WALES 1838-1854

CHART XXIII

the active working period of life, it must be obvious that that nation is the most productive, and its people enjoy the largest measures of longevity, and shall I add prosperity, which can bring the largest proportion of its people up to the threshold of old age.

Possibly the most encouraging results have been obtained among insured lives, where a definite effort has been made to extend the life span. In 1909 the Metropolitan Life Insurance Company began an active campaign of health education among its millions of Industrial policyholders. This was supplemented with the development of nursing care for those who were acutely ill. The death rate since then has shown continuous improvement, dropping about one-third in the interval. Accompanying this drop in the death rate, there was an increase of eight and one-half years in the expectation at birth for these insured lives representing the working population of America.

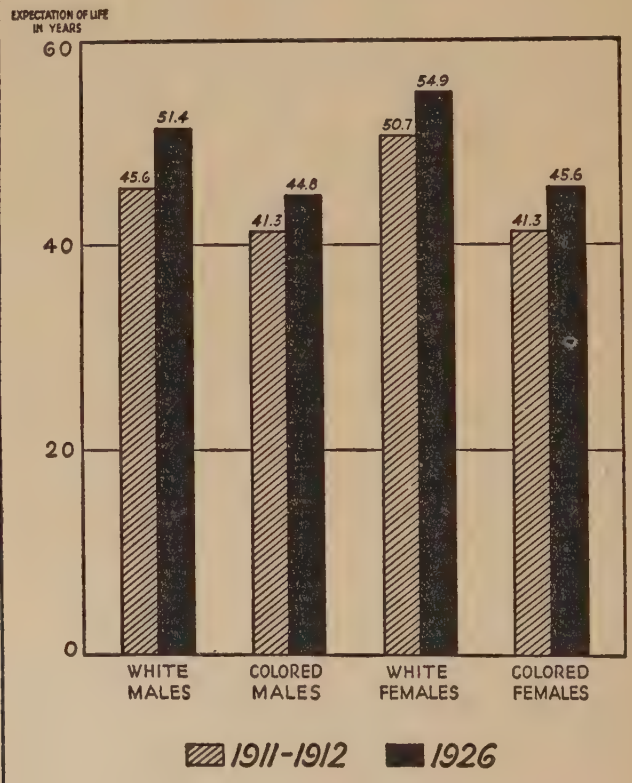
The following chart shows the gains in expectation of life at age ten among the four classes of insured persons (white males, white females, colored males and colored females).

The significant thing about this insurance experience is the light that it throws on the possibilities of further life extension. The mortality rate and the corresponding average after-lifetime respond very quickly and favorably to intelligent effort. The same thing has happened in the general population of the United States and in the European countries whose figures we

CHART XXIV

EXPECTATION OF LIFE AT AGE 10

Metropolitan Life Insurance Company
Industrial Department
1926 COMPARED WITH 1911-1912



have quoted, but the response has been less pronounced, probably because conservation work was applied less exactly and less intensively. The lesson is forcibly brought home that we are still far from having attained the maximum possibilities in the extension of human life under present conditions in any group among whom the experiment has as yet been tried.

V

What, then, are the possibilities for extending human life? This question can have meaning only as it has reference to the present state of our knowledge of preventive medicine and applied sanitary science and to the present levels of human well-being. It would be futile for us to prognosticate on the basis of any substantial future advances in medical, surgical or sanitary knowledge, certain as we may well be that important advances will be made and within a reasonably short time. We are, therefore, virtually compelled, in seeking an answer to our question, to piece together a picture of an attainable mortality experience out of the best experience that now exists. There can be no complaint of undue optimism when we rest our case upon actual achievements or what is on the threshold of achievement. This, then, is our assumption. Let us see what that leads to in the actual working out of our case.

The most important single item of mortality is the record for the first year of life. Thirteen per cent of all

the deaths that occur each year are of children within the first year of age. Infant mortality cuts very heavily into the life expectation because a death in that year erases the entire expectation for that life, whereas a death at a later age, say forty or sixty, removes only relatively few years of life, and as a result the effect on the average is slight. Fortunately, there is compensation for high infant mortality, namely, its relative ease of prevention and control. In the birth-registration area of the United States the infant mortality rate dropped in 1926 to 72 per 1,000 births. In New Zealand, in 1924, it was 40 per 1,000 births for the entire country, and there are a large number of cities in the United States, some of good size, where the infant mortality at the present time is below 40 per 1,000 births. We have, accordingly, started our hypothetical life table with the basic assumption that an infant mortality rate of 38.2 expresses an entirely realizable figure under present conditions, although it is only a third as great as that in the 1910 life tables. If anything, this assumption for the infant mortality leans over to the side of conservatism, because the assumed value has not only been attained in any number of places, but there is every indication that it is attainable by the whole country within a relatively short period of years. We can, in fact, surpass it by paying attention to one particular, namely, the suppression of the infant mortality of the first month in which hardly anything has as yet been achieved on a countrywide scale. In another place, I have recently outlined a

procedure which, I am confident, will do for early infant mortality what the general baby welfare movement of the last twenty years has accomplished for children above the first month. The detection and handling of syphilis in the mother, the control of the toxemias of pregnancy, and the provision of good obstetrics for the great body of parturient women, coupled with the type of nursing care now largely available in the cities of the United States, will give us what we hope for. This favorable level of the infant mortality rate has been amply demonstrated as attainable. Infant mortality rates of 20 per 1,000 births and even below that are on the horizon. We have assumed a higher rate of 38.

In like manner, we have proceeded on the general assumption that the mortality in the succeeding four years of childhood is materially reducible. Our assumed figures for the second, third, fourth and fifth years vary between 34 and 40 per cent of the actual mortality rates for the respective ages in 1910.* Each one of the values was determined with the greatest care, having in mind the rates prevailing in the most favored countries, and what we know can be done to prevent mortality from the diseases and conditions of the pre-school years. Thus, we have assumed a mortality rate of 4.2 per 1,000 for the third year of life. In New Zealand, about six years ago, the rate was 4.4. Our figure is only 4 per cent below the New

* At the time this Hypothetical Life Table was prepared, the latest official table for the population of the United States was for 1910.

Zealand figure. In the third year of life virtually two-thirds of the entire mortality is due to such infections as typhoid fever, diarrhœa and enteritis, the four communicable diseases of childhood—measles, scarlet fever, whooping cough and diphtheria—tuberculosis and the respiratory diseases. Who will deny that these conditions are now within control, provided we mean to control them? How great is the promise for the eradication of diphtheria through the general application of methods now employed in our country, *viz.*, that of wholesale inoculation of children with toxin-antitoxin? Yet, diphtheria looms large in the mortality not only in the third year of life, but in all of the years of childhood after the first.

Between the ages of ten and sixty, in that broad fifty-year span of life, we have made one basic assumption throughout, namely, that mortality can be reduced to one-half of the figure which prevailed in 1910. This is an important point in the procedure of building up our hypothetical life table. Between ages five and ten, the values were interpolated so as to give a smooth juncture between ages three, four and five and the ages after ten. It meant graduating the values from 40 per cent of the 1910 mortality at age five to 50 per cent of the 1910 figure at age ten. At age ten we used a death rate of 1.1 per 1,000; the New Zealand value was 1.3. The vital item in our procedure was, however, the assumption that in the age range covering virtually the entire active period of life from ten to sixty, the mortality is capable of

a 50 per cent reduction from the 1910 figure. Again, our values are only from six to twenty per cent below those for New Zealand in recent years. But in that country, as in our own, there is still much preventable mortality from tuberculosis in the working period of life. There is also the serious mortality from occupational and other accidents. In the latter part of this broad age period there is already a heavy death rate from the diseases of the heart, kidney and blood vessels, much of which is preventable and has actually been prevented or postponed in limited groups of the population.

Our assumed rates between ten and sixty are, moreover, very close to those attained by the best life insurance companies in their current Ordinary experience. At some of the ages, the actual insurance experience is even lower than the values we have assumed. We in the life insurance business are more and more impressed with the splendid possibilities before us for the further curtailment of mortality among insured persons. Through such procedure as the annual physical examinations and the hygienic follow-up to encourage the insured to bring their impairments under medical supervision, we hope to attain large results. An investigation into the mortality of a group of Ordinary policyholders of the Metropolitan who had availed themselves of the privilege of the Life Extension Institute examinations over ten years ago, showed at the end of the period, a mortality 18 per cent lower than that of the best control group we could

muster, having in mind all the logical requirements of the comparison.

We are especially optimistic as to the future because of the amazing reduction in the death rate from tuberculosis which is occurring throughout the world. Since 1911, the disease has declined 55 per cent among those insured in the Metropolitan and almost as much in the general population of a number of progressive cities. The disease is not only declining rapidly in actual mortality, but the peak or maximum rate by age is constantly being pushed forward into the later years of life. This has the effect of extending the expectation. On the other hand, we are not doing so well with reference to the diseases and conditions which reflect personal hygiene and the general care and use of the human body. The death rates from the so-called degenerative diseases, like heart disease, Bright's disease, cerebral hemorrhage and the other diseases affecting middle life and the older ages are not declining. We are making little headway in spite of increasing public and medical interest in them. These deaths represent heavy losses to the community because they involve in many instances people still in their prime and at the height of their usefulness. The development of a well-conceived campaign against these losses, organized along lines which have proved successful against tuberculosis, will, according to the best medical opinion, produce excellent results. Together, the three diseases—heart disease, Bright's disease and cerebral hemorrhage—curtail the expectation by about

four years. A further reduction in the incidence of the acute infectious diseases, such as typhoid fever, diphtheria and acute rheumatism, which are so fruitful in producing damage to the heart, kidneys and vascular systems of young people, will bring important results, as will also the extension of health education and the inculcation of better health practices among adults. It is reasonable to expect that an appreciable part of the mortality reduction postulated by our hypothetical life table will be accomplished through these means.

The further extension and the more intensive application of the life-saving campaign to industry likewise holds out much promise. The prevention of occupational mortality has scarcely been begun as a nation-wide effort. There can be no question that certain industrial processes widely developed throughout the country seriously shorten the life span. The effects of excessive heat, of poisonous fumes, of deleterious dusts and actual contact with poisonous substances, unduly long hours of labor, all result in raising the mortality rate of industrial workers far above those of the general population. The excellent physical endowment of industrial workers assures a greater life expectation under conditions of improved industrial hygiene than is actually attained at the present time. Occupational accidents alone are still responsible in the United States each year for as many as fifteen thousand deaths, for the most part of men in their prime. Employers of labor can give material aid in the campaign to reduce adult mortality in America.

The ever-growing interest of employers in safety measures and in shop sanitation gives much encouragement for the future.

Please notice that we have limited ourselves to those possibilities of life saving which are reasonably likely to occur on the basis of past experience. We have made no allowance for any possible saving from cancer, for example, because it would evidently involve more knowledge than we now have of the causative factors of this disease. In like manner, we have made no assumption of life saving in old age, that is from, say, age seventy onward, because during the last half century there has been practically no improvement in the mortality among aged persons. The only liberty we have taken in the preparation of our hypothetical life table is to graduate the mortality values from 50 per cent of the actual in 1910 at age sixty to 100 per cent mortality at age seventy. This provides a smooth and reasonable transition from a period where. life extension is still somewhat possible to one where no substantial gains are at present in sight.

VI

We are now ready to show you this hypothetical life table which expresses the best mortality we may hope for with our present knowledge and in the light of our actual achievements (see Table 16). The total expectation of life at birth is sixty-four and seventy-five hundredths years; or, for the purpose of easy

reference, let us say, sixty-five years. This means an addition of seven years to the life span now prevailing in the United States. According to this table, a person

TABLE 16

Hypothetical Life Table

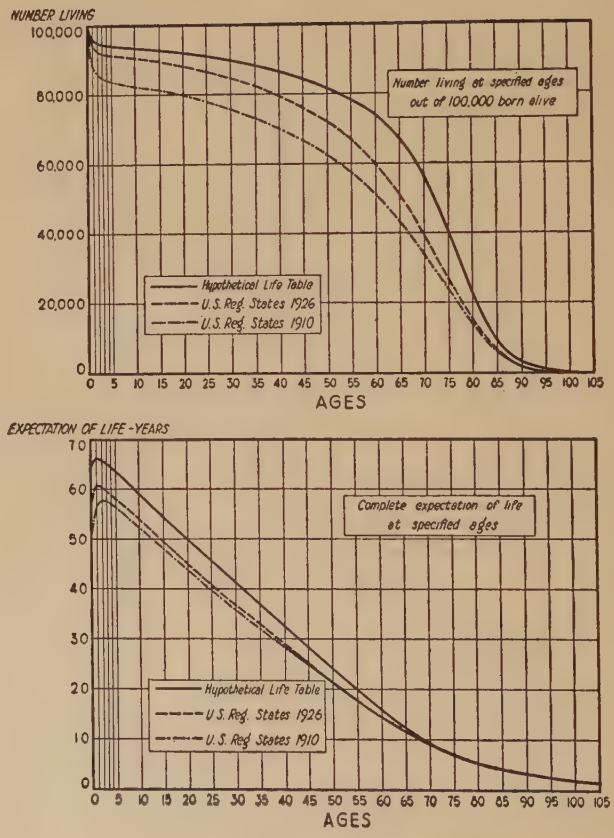
Age	Number living in specified age interval	Mortality rate per 1,000	Expectation of life
0	100,000	38.21	64.75
1	96,179	10.00	66.30
2	95,218	4.20	65.97
3	94,818	2.80	65.24
4	94,552	2.25	64.42
5	94,339	1.85	63.57
10	93,648	1.14	59.02
20	92,269	2.34	49.82
30	89,772	3.26	41.06
40	86,318	4.70	32.49
50	81,542	7.19	24.08
60	73,882	14.29	16.01
70	56,213	56.45	9.17
80	22,818	130.28	5.29
90	3,110	249.62	3.03
100	67	401.91	1.85

NOTE.—Constructed from Life Table for United States Registration States, 1910, on following assumptions as to mortality rates:

Age	Assumed reduction from 1910 rates
0 to 5	Approximately two-thirds
5 to 10	Two-thirds to one-half
10 to 60	One-half
60 to 70	One-half to no reduction
70 and over	No reduction

COMPARISON OF SURVIVORS AND OF COMPLETE EXPECTATION OF LIFE

Life Tables for U.S. Registration States, 1910 and 1926 and Hypothetical Life Table



of twenty, that is, one who is about to enter active adult life, would have an average expectation of fifty years of after-lifetime. That means that those crossing the threshold of manhood and womanhood may expect, on the average, to attain age seventy. What a curious confirmation our figures give to the biblical allotment of threescore and ten!

A comparison of our hypothetical life table with the expectation prevailing in the registration states in 1926 indicates a possible gain of seven years at birth; of fully five years at age twenty; of four years at age forty; of three years at age fifty; and of one and three-quarter years at sixty; at seventy and thereafter there is little or no gain to be expected because no improvement in the mortality rates was assumed in the construction of the table. The greater part of the gain is obviously limited to early life, where there is still the greatest opportunity for preventing mortality. But the possible gains in middle life are sufficiently large to justify every effort in their attainment.

How great these gains would actually be is shown by comparing the number of deaths now occurring in the United States each year with those which would occur under the death rates called for by our Hypothetical Life Table. The total death rate would be reduced from 12.3 to 8.6 per 1,000, assuming no change whatever in the age constitution of the present population. In other words, an extension of the expectation by seven years in accordance with the suppositions of our Life Table would be accomplished by

a coincident reduction in the death rate of 30.1 per cent. On the new life-table basis, there would be a total of close to 1,006,300 deaths in the United States as against a total of approximately 1,442,000 which occurred in 1926, or equivalent to a saving of 435,700 lives a year. The greatest saving would be accomplished in the first year of life. A reduction of the infant mortality to the rate assumed by us means a saving of 69,000 infants a year. In fact, the saving would be 88,500 children in the first five years of life. The saving, on our assumption of reduced mortality between the ages ten to sixty, is equivalent to a reduction of 230,200 in the number of deaths in that age period. These large figures show very strikingly how great are the stakes involved in the program of life saving implied by the Hypothetical Life Table we have constructed. It is very encouraging in this discussion to remember that these savings are just as reasonable as are the assumptions of reduced mortality whose plausibility we have defended in our previous sections.

Possibly, in my assumption of virtually no improvement after the close of active life, I have opened myself to serious criticism. There are those who on plausible grounds see much improvement in mortality at the older ages as a possibility for the future. They are much impressed with the large results being obtained in small groups through emphasizing more intensive personal hygiene. They are not over-impressed with the fact that the last half century has shown no

response at the older ages to the improved conditions of life. They profess to see that much of the mortality from the so-called degenerative diseases that prevails at the older ages can be curtailed by preventing the infectious diseases of early life, and by more reasonable and intelligent conduct of our personal lives. All of this seems very reasonable and I should regret very much if it were assumed from what I have presented that the span of human life is practically fixed and that no material extension of it can be expected beyond the average of sixty-five indicated by my life table. The figure that we have presented is simply a summary of what we believe to be the most probable figure, having in mind the present state of our knowledge. It is entirely conceivable that a medical discovery of the first order which would do for, let us say, chronic nephritis, what the newer therapy has accomplished for syphilis, or what promises to be accomplished for diabetes, would add somewhat to our maximum figure. The additional gain would not be very much because the saving would be at the advanced ages when the expectation is low by comparison. All of this, however, is for the future and it would be idle for us to dwell at this time on such possibilities.

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